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Patent Procedure

IN few, if any, quarters is the interest in patents greater than in those concerned with the manufacture of chemicals or chemical plant. Scientific industry is based upon patents and experience. When patents lapse and experience becomes more general monopoly due to these dual causes soon ceases. When there is nothing to be gained in the way of patents or experience to encourage purchasers to buy from a particular maker, it is not long before competition, frequently of the "cut-throat" type of which the world has had too much during the recent depression, removes much of the initial profit from the venture. This fact should be borne carefully in mind before any change is made in patent procedure. It is necessary to safeguard genuine and existing patents so that the inventor or those who have purchased the invention should receive their due reward. Revocation or compulsory licences must be granted with the utmost care. The rights of the poorer inventor must be carefully safeguarded.

The "Business of Courts Committee" has published its final report in which has been considered, *inter alia*, the possibility of improving procedure in patent actions with the object of saving time or of reducing the costs. The courts have to administer the law so as to do justice to the individual and to safeguard the interests of the nation, the latter phrase being interpreted as "public interest" in the widest sense of the term. It has seemed to many that patent procedure could be simplified if the rights of appeal to higher courts were restricted, so that the action would not be automatically awarded to the longest purse; that the simpler patent disputes could be settled by the Comptroller of Patents or some similar person appointed for the purpose; and that, in the actions that must be heard by a judge, the use of a specialist judge having expert scientific knowledge would accelerate the procedure. The committee has considered and has rejected all these suggestions. The complicated nature of many patent actions, coupled with the need for justice and for the satisfaction of the individual that he has received justice, has caused the committee to refuse to limit the rights of appeal to higher courts.

That decision is no doubt right from a legal and theoretical point of view, but is it not largely due to the fact that the courts trying the case are composed of judges who, in the words of the committee, "have to learn and do learn to deal with such matters"? It is wonderful that in such circumstances judges perform their work so well as they do, but is it not a little hard

on patentees that they should have to pay fees to lawyers and expert witnesses for the purpose of teaching the judges? For that is the only construction that can be put upon the committee's admission. Nevertheless, much of the case for the appointment of expert judges, however valuable it may be in theory, falls to the ground in practice because the machinery existing for the employment of assessors or court experts does not seem to be used by litigants. The committee quite rightly decided that there is no ground for forcing this machinery upon those who do not desire to use it.

There will be general agreement with the committee's recommendation that cases should be clarified before being brought into court. If justice is to be done, patent actions should be fought upon scientific and technical facts. These facts should be capable of precise determination and the experimental work should be done before the action commences. A set of experiments supporting one side of the case is either right or wrong. It can best be determined which if the matter is put to the test by *both* sides before being brought into court. Expert witnesses must accept personal responsibility for their evidence, but they are not infallible. Experts differ at every scientific meeting. To enable the cases to be thoroughly understood before coming into court—and probably many cases under these conditions would never come into court—the committee suggests that the rules should be amended to enable the judge (a) to order the scientific evidence to be embodied by the parties in affidavits subject to cross-examination and to be exchanged between the parties before coming into court and (b) to order the parties to exchange statements setting out all matters of fact and contentions of law on which they intend to rely at the trial.

The committee also holds that opposition to a patent should be made possible on the ground of want of subject matter and declares that "if it were possible to take this objection a large number of the patents now granted would not be granted." Patents which "are put on the file simply to discourage competition" should be rejected, and would be rejected by this procedure. The chemical industry will agree with the committee's statement that "in many quarters this abuse is regarded as a serious interference with industry. In the public interest this question should be investigated." This matter of blocking patents, coupled with the relative ease of obtaining a British patent, has long been the subject of uneasiness to those whose desire is that British industry should develop freely, rapidly and legitimately.

Notes and Comments

Works Maintenance

THE trend of the chemical industry is towards lower costs and cheaper selling prices, a better and purer product, and delivery to a time schedule. We were reminded by the production director of Boots Pure Drug Co., Ltd., at the annual dinner of the British Chemical Plant Manufacturers' Association last week that rationalisation, or "planned efficiency," has enabled the industry to meet this modern tendency. Organisation of production, chemical control of processes, the evening up of loads and installation of new processes and plant count for a great deal, but the fact remains that the most important thing is to keep the wheels going round. That, in a nutshell, is what works maintenance means, and that is why we publish an annual Works Maintenance Number of THE CHEMICAL AGE. The term "repair and maintenance" is generally used to denote the keeping of buildings, plant and equipment in a good state of visible repair, that is to say, the renewal of broken, worn or corroded parts, and other similar jobs without which the plant, or part of it, would cease to function. The true meaning, however, is, or should be, the keeping of the plant not merely running, but in the highest state of efficiency, so that the cost of production may be as low as possible, and this requires the closest co-operation between the production staff and the repair staff. It is up to the production staff to watch for the first signs of failing efficiency and to take steps to put things right before the trouble becomes serious. This is often difficult, particularly with continuous processes where access to the plant for interior examination can only be had at long intervals and when output requirements militate against stopping plant for repairs. Constant co-operation between plant users and plant makers is essential, for the man with whom the information gained in the actual running of plant should be shared is pre-eminently the man who made it.

I.C.I. and the Sale of Arms

WIDESPREAD fallacies concerning the part played by Imperial Chemical Industries in the manufacture and sale of arms have been disproved by the evidence which Sir Harry McGowan and a number of his colleagues gave to the Royal Commission at Westminster last week. Some of the evidence was necessarily confidential, but the company gave in full all the information which the Commission could reasonably require, and supported its evidence with suggestions which deserve further exploration. Sir Harry disclosed that the proportion of munitions business to the whole trade of Imperial Chemical Industries is 1.8 per cent., and of the profits 1.4 per cent. Its interests are therefore obviously allied with peace conditions and it is agreeable to such control of munitions profits as will provide only a fair return on the capital involved. The company has not been a party to any "ring," but on the contrary has often found purchasers playing off one manufacturer against others with consequent unduly increased stringency of specification and depression of prices to unreasonably low levels. For companies now forming part of I.C.I. Sir

Harry claimed that their services in the war period were acknowledged as invaluable and satisfactory. He preferred, in our opinion quite rightly, not to enter into controversy on the relative costs of private and Government manufacture, as the requisite data on comparative lines are not available. As Sir Harry pointed out, a State monopoly would be costly and take a long time to establish, while to have a State monopoly of the chemical industry of this country engaged in exports in competition with other countries has only to be mooted to reveal an untenable position.

A Shadow Ministry of Munitions

A BUSINESS-LIKE suggestion for dealing with one of the more difficult problems of national organisation, and one which is worthy of consideration by the Government, was put forward by Sir Harry McGowan at the close of his evidence. The considered view of the company, and the concrete proposal which it made for normal periods, he said, was that there should be State factories as at present, together with private industry receiving a reasonable share of orders (profit controlled). They should both be guided by an authoritative body which had surveyed the whole field; this body would be a shadow Ministry of Munitions. Behind such a plan, added Sir Harry, Imperial Chemical Industries would throw its whole resources. Representatives of the Government and of private manufacturers in this authoritative body would presumably consider how plants producing goods for peace could be quickly turned to the manufacture of the necessities for war. In peace time the committee would be an assurance that proper control was being kept of the manufacture of armaments. Its existence would certainly not make war any more likely, but it would remove the danger of improvisation that marked the last war, and it would also remove all grounds for the suspicions that have led to elaborate inquiries both at home and abroad.

The British Industries Fair

THE great interest which the King has always shown, as Prince of Wales, in the British Industries Fair, will be maintained next Monday when, according to present arrangements, His Majesty will visit the Fair shortly after the opening. In associating his first public engagement with the furtherance of British industry His Majesty is setting his seal upon the enterprise of every exhibitor. So far as the chemical industry is concerned, the section will display evidence of considerable progress during the past twelve months. More chemical manufacturers are exhibiting and a number of new products will be shown for the first time, notably Monastral Fast Blue BS, the new blue pigment discovered by Imperial Chemical Industries, which has been officially chosen by the Association of British Chemical Manufacturers as the outstanding achievement of the chemical industry during the year. The chemical section will occupy the same position as last year, in the front of the main hall, and the Association's stand will as usual serve as the general headquarters of the industry for the period of the Fair.

The British Industries Fair, 1936

Exhibits at Olympia

It is authoritatively announced that the King's first public engagement since his accession will be a visit to the London section of the British Industries Fair. According to present arrangements the King hopes to visit the Fair shortly after it opens next Monday. As Prince of Wales, it will be remembered, the King flew to the Birmingham section of the Fair at Castle Bromwich last year and among the engagements which, as Prince of Wales, he was to have carried out was the inauguration banquet of the Fair at the Mansion House, now cancelled.

IN the home market during 1935 the British chemical industry shared in the general improvement enjoyed by those trades which form the main outlet for its products, particularly the rubber, paint, iron and steel, plastics and artificial silk industries.

The Board of Trade official figures for the exports of chemicals, drugs, dyes and colours amounted to £20,420,133 as compared with £19,556,545 in 1934, and £18,567,696 in 1933, an increase of £863,588 and £1,852,437 in the two years respectively. This gradual but sustained improvement is most satisfactory, particularly in conjunction with the fact that British exports as a whole now exceed those of 1928 and lead the world in this particular. Imports of the same class of materials amounted to £11,941,031 in 1935, as compared with £11,289,980 in 1934 and £9,923,496 in 1933; the increase of £652,051 over 1934 compares with the increase of £1,266,484 in 1934 over 1933. The main increases were in sodium and potassium compounds and drugs. On the basis that imports pay for exports this is satisfactory, but at the same time, when allowance is made for necessary raw materials and products which cannot be made here economically, the imports indicate clearly that there is a considerable proportion of the home market that could "Buy British" to the national advantage.

The most important event of the year, both from the popular and from the technical point of view, was the commencement of production at the coal hydrogenation plant at Billingham. Following close on its heels came the announcement of the discovery of a new blue pigment—Monastral Blue—with exceptionally valuable properties for many industries. This in turn has been followed by the discovery of a new dyestuff for artificial silk. Among other important developments during the year may be mentioned the commercial production of decahydrogenated naphthalene as a solvent, the commercial production of phenacetin and the extended development of titanium pigments.

The view of leaders of the industry as to the improvement in the general situation is shown by the number of capital issues of leading chemical firms during the year and the number of new companies registered. Trade agreements were signed during the year with Italy, Turkey, Uruguay, Brazil, Roumania and Poland. In the case of the last agreement, the Association of British Chemical Manufacturers was entrusted by the Board of Trade with the detailed negotiations with the Union of Polish Chemical Industries, which resulted in the reduction or stabilisation of the duties on a long list of chemicals. The Association urged upon its members the importance of taking advantage of the facilities

thus obtained and sent out an official mission to make contact with the various chemical organisations and purchasing bodies in Poland. It is reassuring to know that already the export trade of chemicals to Poland is showing a definite increase.

In addition to the new products referred to later, attention may be drawn to the new factory at Bromborough Port for the fermentation of molasses and the production of solvents from alcohol, to the development of solvent processes for the production of lubricating oil, the development of the use of butane in cylinders for domestic fuel purposes, while there has been a number of interesting developments in connection with plastics and resins.

The Chemical Section of the Fair, which is again under the auspices of the Association of British Chemical Manufacturers, is in the same position as last year, in the front of the Main Hall. The Association has an office on Stand A 207, where literature will be distributed and inquiries answered as to sources of supply. The literature will include the Association's main directory, covering all the products of its members, in six languages, namely, English, French, German, Italian, Spanish and Portuguese, and the Directory of British Fine Chemicals, which will indicate the manufacturers of over 3,000 fine chemicals in general use. Information regarding the services rendered to the chemical industry by the Association of British Chemical Manufacturers will also be available, with samples of the Association's regular publications, such as its monthly summary of chemical trade, its safety circulars and its quarterly safety summary.

The product selected for display this year on the stand of the Association of British Chemical Manufacturers, as representing the outstanding achievement of the chemical industry during the year, is Monastral Fast Blue BS. It is the first blue pigment to have been discovered since ultramarine in 1826, and possesses all the qualifications demanded of a pigment to an enhanced degree, viz., fastness to light, heat, acids and alkalies, chemical inertia, high tinctorial value, and brilliance of shade. It has already made an extraordinary appeal to a large range of industries including those concerned with the production of printing inks, paints, colours, paper, bookcloth, linoleum and plastics.

Among other new products may be mentioned the commercial production of phenacetin for the first time in this country. This is an achievement on which the fine chemical industry is to be congratulated. Para-diazo-diphenylamine sulphate is another new product used in preparing the new type of sensitised photo-printing paper.

What to See at the Fair

Albright and Wilson, Ltd.

(Stand A 162)

THE stand occupied by Albright and Wilson, Ltd., will be on the lines that have characterised the firm for many years. The various forms of phosphorus which have been the principal products of the company since its foundation by Mr. Arthur Albright in 1844, are shown in the centre show case. The important compounds of phosphorus, such as oxychloride and trichloride are also on view. The pure and technical grades of phosphoric acid and the numer-

ous phosphate salts occupy an important position in the chemical industry to-day, particularly the pure food phosphates—acid sodium pyrophosphate, sold under the trade name "Antelope" (for the bakery trade) and acid calcium phosphate 80 per cent., universally known as "Ibex" (for the milling industry).

Last year sodium hexametaphosphate was introduced for the first time with the distinction of the most interesting chemical discovery of the year. Since that time "Calgon," its trade name, has become well-known in the laundry and textile industries. Its applications are numerous owing to

its remarkable property of softening water without the formation of a precipitate, thus preventing the appearance of insoluble lime soaps in the washing processes employed in those industries.

Di and tri-sodium phosphates are shown in two forms—hydrated and anhydrous. The crystalline forms have been known for many years, but the anhydrous salts containing 50 per cent. and 40 per cent. P_2O_5 respectively have recently created considerable interest, particularly in export markets, where their economy in the saving of freight make them especially attractive. A full range of all the important salts of ortho and pyro phosphoric acid will be exhibited. These include ammonium, potassium, sodium and calcium phosphates. The glycerophosphates and hydrophosphites are also in the central show case on the stand.

Stafford Allen and Sons, Ltd.

(Stand A 176)

AFTER an absence of several years, Stafford Allen and Sons, Ltd., are once again showing a comprehensive range of their products. Pharmaceutical preparations and essential oils have a prominent part on this stand, particular attention being drawn to StaffAllenS standardised drugs, including digitalis, squills and "Erbolin," a stable, physiologically standardised preparation of ergot, having certain advantages in use which have earned for it an ever-increasing appreciation. A varied range of essential and terpeneless oils is also shown, for the most part being of StaffAllenS distillation from herbs and flowers grown on their own farms in Suffolk. These include oils for flavouring purposes and oils used in perfumery. A prominent position on the stand is given to the expressed oils of almond and apricot kernels, two products of the firm which have a world-wide reputation.

Much research work has been done by Stafford Allen and Sons, Ltd., on the insecticides pyrethrum and derris, and a comprehensive range of preparations of these drugs is shown, including the oleo-resins, the liquid extracts and the powdered drugs. The results of much of this research work have been published in booklets which are of great interest in agriculture and horticulture.

At this stand there is a special display of concentrated perfumes for use in all types of cosmetics, perfumes, soaps, creams, etc., also a range of isolates, including eugenol, isoeugenol, rhodinol and geraniol. A representative range of flavouring essences for use in the confectionery and mineral water trades is also shown; also some special flavours and perfumes for use with tobaccos.

A. Boake, Roberts and Co., Ltd.

(Stand A 156)

A VARIED range of fine chemicals, essential oils, and intermediates is shown by A. Boake, Roberts and Co., Ltd., including several of which they are the only manufacturers in this country, such as musk ambrette, musk ketone, musk xylol, phenyl ethyl alcohol, amyl cinnamic aldehyde, benzophenone, geranids, citronellol, citronellal, ethyl acetate, ethyl sodium oxal acetate, heliotropin, acetins, ethyl phthalate, ionones, iso eugenol and linalyl acetate.

The quality of terpeneless oils in the past has been such that there has been little use for them in the highest quality products, in spite of the many advantages they should confer. Boake, Roberts and Co., Ltd., however, are now offering a number which have been prepared by a new process and their success has been immediate amongst those users who can afford to pay the price for such high quality materials. Pharmaceuticals are guaranteed to comply with all the requirements of the British Pharmacopoeia and British Pharmaceutical Codex.

Among other products are phosphoric acid in various grades, a wide range of phosphates, liquid sulphur dioxide, sulphites, bisulphites, hyposulphites (photographic), and sulphonated castor oil (40 per cent., 50 per cent. 70 per cent.

and 80 per cent.). Metallic acetates, formates, oleates, stearates, linoleates, palmitates, resinates, naphthenates, ricinoleates, laurates and borates for use as driers are guaranteed to contain a definite metal content and can be supplied in fused and precipitated form.

A wide variety of solvents, plasticisers and gums and resins chiefly used in the preparation of cellulose nitrate and cellulose acetate lacquers, plastics and moulded products, and in the paint and varnish trades and in printing inks, are also shown. They include butyl acetate, amyl acetate, ethyl acetate as solvents, tricresyl phosphate, dibutyl phthalate as plasticisers, and glycerine resin esters (ester gums) and glyceryl phthalate resins (glyptals).

The British Drug Houses, Ltd.

(Stand E 684)

AS at last year's Fair, the B.D.H. exhibit is confined to selected products of outstanding importance illustrating the diversity of the company's activities. It comprises, on the one hand, a wide range of pure chemicals for medicinal and pharmaceutical purposes, and on the other hand a selection of laboratory chemicals and apparatus for general scientific use.

The fact that the company's activities are by no means limited to the production of articles for medicinal use is demonstrated by the inclusion in the exhibit of a selection from a vast number of pure organic and inorganic chemicals for use in research and analysis. Included are examples from a range of 220 chemicals characterised by the word "AnalaR" and guaranteed to conform to the specifications for purity published in the book of "AnalaR Standards for Laboratory Chemicals" as formulated and issued jointly by The British Drug Houses, Ltd., and Hopkin and Williams, Ltd.

This exhibit also contains examples of indicators, microscopic stains, micro-analytical reagents and outfits designed to facilitate various tests in technical and biochemical work. The latter include the B.D.H. comparator and B.D.H. capillary for the determination of pH values using standard colour tubes containing buffer solution and indicator as well as the B.D.H. Lovibond comparator which employs coloured tintometer glasses as standards. The exhibit also includes the B.D.H. pattern Lovibond tintometer which is the standard instrument for all colour matching. Two entirely new outfits in this group are the B.D.H. Lovibond nessleriser for colorimetric analysis and the B.D.H. Lovibond limitester for colorimetric limit tests, both of which employ tintometer glasses as standards instead of comparison solutions.

British Industrial Solvents, Ltd.

(Stands A. 175 and A. 184)

ALL the products manufactured synthetically by British Industrial Solvents, Ltd., are derivatives of alcohol. It is the policy of the company, wherever possible, to use raw materials of British manufacture. In a few cases where insufficient or no British supplies are available, they have to rely upon imports to meet their requirements. In practically every case, however, the products they offer are 100 per cent. British. The productive capacity of their works at Hull and Carshalton is very great, acetic acid, acetone, normal butyl alcohol and mixed esters being made in large quantities. Should the demand for any of the chemicals which they make increase, their plant could be easily and rapidly enlarged to meet the new conditions.

The company intends having available samples of all the products manufactured, which as is well known include acetic acid, acetone, aldehydes, butanol and esters. The majority of these solvents and plasticisers find extensive application in the manufacture of nitro-cellulose and cellulose acetate finishes and in addition to these, a number of new materials are shown which will undoubtedly arouse considerable interest. There is also on view a very interesting chart showing the derivation of their products from ethyl

alcohol, and also a series of photographs of their works at Hull and Carshalton which give a very good idea of the resources of British Industrial Solvents and their ability to supply the solvent needs of the British market.

W. J. Bush and Co., Ltd.

(Stand A. 158)

ALL the essential oils which can be economically distilled in this country, such as peppermint, cloves, nutmegs, lavender and sandalwood, especially distilled for perfumery purposes are being shown by W. J. Bush and Co., Ltd. A long range of fine chemicals and perfumery products, both natural and synthetic, is also exhibited, the following being indicative of the series: Vanillin, coumarin, heliotropine, salicylic acid, sodium salicylate, aspirin, cinnamic aldehyde, terpineol, phenyl ethyl alcohol, benzoic acid, sodium benzoate and cream of tartar.

The Gas Light and Coke Co.

(Stand A. 178)

ON this stand are shown specimens of tar products, which result from the distillation of over 32,000,000 gallons of tar per annum. All these products are ordinarily made to standard specifications, but in some instances exceptional requirements of clients can be met. The principal tar products exhibited are refined tars, pitches, creosotes, carbolic acids, tar spirits, comprising benzenes, toluenes and xylenes, pyridines, naphthalenes, etc.

Of particular interest to the plastic trades is the range of phenols, carbolic and cresylic acids. The erection of a new carbolic plant has enabled the company to produce phenol of the highest purity and cresols of special boiling ranges; a number of xylene fractions are also produced. Another interesting product is pure pyridine, which is produced within a very narrow distilling range. Cyanogen products are also exhibited, comprising yellow prussiate of potash, bronze blues, sulphuric acid and green copperas. The prussiate of potash is of exceptionally pure quality, and is produced in small crystal form, which is much easier to dissolve than the old form of large crystals.

The General Chemical and Pharmaceutical Co., Ltd.

(Stand A. 208)

AMONG the points which attract attention to the exhibit of The General Chemical and Pharmaceutical Co., Ltd., is the important development in containers for analytical reagents. This company has adopted during the past year an improved screw-stoppered bottle fitted with moulded cap which affords added protection to the product and is proving a great convenience to users.

The exhibit includes examples of the very wide range of general laboratory chemicals manufactured by the company and marketed under their registered trade mark "Judex." A number of "Judex" analytical reagents, A.R., are also shown.

Much interest continues to be shown in the range of organic reagents for the detection or determination of very minute quantities of metals, the commercial manufacture of which in England was initiated by the company in 1927. It is satisfactory to note that not only is the industrial use of these "special reagents" introduced by the company, increasing rapidly, but that their use is also now to a considerably increased extent being taught in colleges and schools.

Developments since the last British Industries Fair have been directed primarily towards increased purity of product through the medium of further improvement in methods of analytical control at various stages of manufacture. The development programme has been based on continuous improvement in these two closely related directions and has led to a further substantial increase in export business, Judex

reagents being recognised as being in very many instances of materially higher purity than the corresponding products of continental manufacturers.

The Guelph Cask, Veneer and Plywood Co., Ltd.

(Stand G. 929)

THEIR usual comprehensive range of "Guelph" casks, as well as new types and styles, is being exhibited by The Guelph Cask, Veneer and Plywood Co., Ltd. Their range of strengths, sizes, styles, types of linings, etc., is such as to give this firm a unique position and the stand will be of interest to all who have to deal with the packing of chemical products other than those in liquid form.

Hopkin and Williams, Ltd.

(Stand A. 204)

THE exhibition of AnalalR laboratory chemicals is again a feature of the stand occupied by Hopkin and Williams, Ltd. The production of reagents under this registered name is entirely in the hands of the two concerns, Hopkin and Williams, Ltd., and The British Drug Houses, Ltd. The standards agreed by the two companies are published in "AnalalR Standards for Laboratory Chemicals." Chemicals purchased under this name are not only of the highest purity but are supplied with analytical particulars on each label and fuller information as to the testing methods employed are obtainable in the publication mentioned. Hopkin and Williams' AnalalR chemicals are packed distinctively in a new type of bottle with moulded screw cap.

Another class of this company's products is also accompanied by appropriate literature; "Organic Reagents for Metals" (2nd Edn., 1934) describes the use of 26 special reagents for this type of analysis and certain of the reagents are exhibited. Two recent products, not yet described in this publication, are phenylarsonic acid (for determination of tin) and 5:7-dibromo-8-hydroxyquinoline (for copper).

The optical properties of phenyl-di-iodoarsine were found by Anderson and Payne ("Nature," 1934, 133, 66) to render it a very valuable medium in the examination of precious stones by refractivity methods. This substance and tetra-iodoethylene, also mentioned in the same paper, are shown.

Howards and Sons, Ltd.

(Stands A. 209 and 211)

SOLVENTS and plasticisers for the lacquer, paint and varnish, textile and dyeing and cleaning trades are shown by Howards and Sons, Ltd. They are now producing a Sextone B (methylcyclohexanone) having 100 per cent. ketone content which has a considerably higher evaporation rate than ordinary Sextone B, while possessing similar solvent properties. Their Sextate has a higher ester content than formerly, now 95 per cent., and therefore an appreciably higher evaporation rate. Diacetone alcohol with a flash-point guaranteed not lower than 130° F. is now available.

For the first time Howards and Sons, Ltd., are showing their new plasticiser for cellulose acetate, Plassitol, which is expected to fill that conspicuous gap which has so far existed among the plasticisers available on the market, a really good acetate plasticiser available at a reasonable price. A new product having valuable properties of great interest to the paint trade is their Diterpene; this is a high-boiling liquid which resinifies mainly by oxidation and partly by polymerisation to give hard and tough protective coatings. On the textile side they are showing Glycerol Lactate, a new dye solvent which is likely to find considerable use especially in printing.

Of the newer pharmaceutical products mention must be made of two new antiseptics:—Capryl-hydrocupreinotoxin—a water soluble derivative of quinine with specific bactericidal action with reference to streptococcus and staphylococcus;

and liquid chlor-thymol—which is largely chlorinated in the side-chain and is a new preservative and antiseptic with a very high Rideal-Walker coefficient (about 150) and is comparatively low in price.

Johnson, Matthey and Co., Ltd.

(Stand D 533)

THE chief feature of the exhibit by Johnson, Matthey and Co., Ltd., is a demonstration of rhodium plating on silverware with the new all-electric equipment which has recently been perfected by this company. A certain amount of space is devoted to the industrial products, such as platinum crucibles, electrodes, silver solders, and Staybrite steel gauze. There is also a display of ceramic materials, which include liquid gold and platinum, and colours for glass, pottery and enamelled iron.

Johnson and Sons (Manufacturing Chemists), Ltd.

(Stand A. 182)

AT this stand there is a complete range of fine chemicals as used in photography, including the important developing agents such as amidol, metol, acid pyrogallol, hydroquinone glycin, azol and chlorquinol. There is also a display of a few of the mixed developers as required by trade photographers, cinematographers, radiographers and other branches of the industry. As usual, a prominent feature of the stand is silver nitrate, which is purchased in large quantities by sensitised material manufacturers.

B. Laporte, Ltd.

(Stands A. 175 and A. 183)

THIS progressive company possesses at Luton one of the finest and best-equipped chemical works in Great Britain, which occupies an area of about thirty-five acres. Its principal product is hydrogen peroxide, of which the company manufactures all strengths, including the concentrated quality (40 per cent. by volume) = 135 volumes. Hydrogen peroxide is almost universally employed as a bleaching agent. In addition, it is used for sterilisation, and as an antiseptic. The bleaching effect of hydrogen peroxide is permanent and eliminates the possibility of tendering the fibres. The company issues a brochure dealing fully with the use of this product as a bleaching agent.

The range of barium products comprises barium sulphide, barium carbonate, barium hydrate, barium peroxide and barium sulphate blanc fixe. Barium hydrate is supplied in crystal form, and is used to some extent as a water softener and a remedy for boiler scale, and to a larger extent in the manufacture of electrical accumulators and glass, in the sugar industry, and for refining animal and vegetable oils. The carbonate is used as a constituent in the manufacture of bricks and tiles for the prevention of scum, also for case hardening and in the manufacture of optical glass and in the enamel industry. Blanc fixe is supplied either in paste or powder form. The paste form is generally employed by paper coaters for the production of art papers and the dry product is used extensively as a pigment in the paint, colour and enamel industry. Large quantities of blanc fixe are also used in rubber manufacture. Sodium perborate is used as the active constituent in the manufacture of oxygenated soap powders. It is also used for bleaching purposes, where the addition of a dry product is preferred to the liquid hydrogen peroxide. Neutral pyrophosphate of soda is shown in both crystal and anhydrous forms.

W. Lusty and Sons, Ltd.

Stand G. 194

A FULL range of plywood "Brolus" barrels is being shown by W. Lusty and Sons, Ltd. A special feature of this display is an absolutely new and revolutionary type of package, in-

roducing many important features which have never before been accomplished in a plywood barrel. It is perfectly dust-tight, eliminating any form of cotton rope lining in the interior, which is clear of all obstructions, and furthermore there is no metal for contents to come into contact with. Actually it is an admirable type of packing for semi-liquids such as soft soap, and is capable of carrying powders of the finest mesh. Paper or linen linings which are often used, can probably be eliminated, and if used, cannot possibly get torn or caught inside.

The Malehurst Barytes Co., Ltd.

(Stands A. 175 and A. 183)

THIS firm is showing some very fine specimens of barytes from its mines at Minsterley, including one perfectly white crystal weighing several pounds, which is the finest specimen ever found in England. The barytes is shown in all grades from the finest superfine white, down to a very finely ground dark off-coloured product. The firm is now able to meet foreign competition both as regards quality and price.

Monsanto Chemicals, Ltd.

(Stand A. 160)

THE exhibit of products on the stand occupied by the Monsanto Chemicals, Ltd., is divided into four main sections, viz.: (1) Phenols and cresols for use by the resins and plastic industry and for medical purposes; (2) chemicals for use in the manufacture of rubber; (3) fine chemicals including medicinal products and pure chemicals for general industry; and (4) germicides, including disinfectants, antiseptics and preservatives.

Phenol is being shown in the form of ice crystals melting at 40° to 41° C., detached crystals melting at minimum 41° C., and liquefied crystals to the B.P. specification. The extensive exhibit of cresols includes pale, dark and water white cresols, pure tri-cresol and the various specialities for which they are well known, consisting of standardised cresols and xylene mixtures.

In a display of rubber chemicals will be seen a representative selection of the Rubber Service Laboratories' colours for rubber and the Curadex deodorants, the latter being new products recently introduced to the industry for reducing and eliminating the objectionable odour present in manufactured rubber materials, such as hot water bottles. These products are made at Ruabon, North Wales, by a subsidiary of the Monsanto Chemicals, Ltd., known as The Rubber Service Laboratories.

Amongst the medicinal chemicals shown on the Monsanto stand the outstanding feature of this year is undoubtedly phenacetin, in both crystal and power form, produced for the first time in this country during the last year and representing a product which has been extraordinarily well received by the British chemical industry.

Germicides include several new products, particular interest being centred round the cresantols, which are materials of very high germicidal value, which are available for the first time in bulk quantities. They are proving of especial interest as preservatives for glues, gelatines, paper and leather finishes and in the textile industry. In addition the well-known chemicals parachlormetaxyleneol and parachlormetacresol are shown as ingredients for non-irritant antiseptics and also as excellent preservatives and mould preventatives. In addition, a full range of black and white disinfectant fluids of the tar acid type is shown.

National Titanium Pigments, Ltd.

(Stand A. 176 and A. 183)

THIS exhibit shows ilmenite, the raw material from which titanium white pigments are manufactured. Small exhibits of various intermediate products are on show to demonstrate the process in use at the Luton works. The principal by-product is copperas and a very good specimen is on view.

A full range of National Titanium Pigments are also on view, comprising ten white pigments, all containing titanium oxide, but otherwise varied in composition to meet the requirements of the trades which use them.

South Metropolitan Gas Co.

(Stand A. 180)

"METRO" chemical products will be exhibited at this stand, and salesmen will be in attendance to answer any inquiry concerning them.

Peter Spence and Sons, Ltd.

(Stand A. 205)

THE name of Peter Spence and Sons, Ltd., is identified with alum and sulphate of alumina, including their well-known "aluminoferric." Their stand displays a full range of these products in a variety of grades suitable for dyeing, lakes and pigments, paper sizing, water and sewage purification, etc. This firm also manufactures numerous other aluminium compounds and its exhibits include sodium aluminate for water conditioning, aluminium stearate and oleate for lubricating oils, paints, etc., oil-soluble alumina for printing inks and alumina gel catalyst.

Derivatives of titanium have been a speciality of Peter Spence and Sons for many years. The titanium section includes stabilised titanous sulphate (a most powerful reducing and dye-stripping agent) and titanium tetrachloride. In connection with leather dyeing the company has for many years manufactured titanium potassium oxalate (T.P.O.) as a mordant and dyestuff giving very fast shades. It has recently introduced "Typhox" (titanium phospho-oxalate) which readily dissolves to concentrated and stable solutions, and gives full and very level shades of great fastness. Of particular interest is "Neosyl," a highly adsorbent colloidal silica powder of extremely fine particle size having a bulk gravity as low as 0.1 gm. per c.c. This product finds application in the textile, cosmetics and pharmaceutical industries.

Spencer Chapman and Messel, Ltd.

(Stand A. 212)

THIS well-known firm is showing the acids for which it is famous, including the following: Oleum (20 per cent., 40 per cent., 60 per cent. and 80 per cent.), battery acid, hydrochloric acid, nitric acid, sulphuric acid, and sulphur trioxide.

The Thermal Syndicate, Ltd.

(Stand A 51)

PURE alumina laboratory ware and mercury vapour discharge burners suitable for laboratory and industrial use are being exhibited by The Thermal Syndicate, Ltd. The former is of special interest to workers in metallurgy and ceramics on account of its high resistance to fused metals, oxides and salts, many of which have no effect on it at high temperatures. The material of the ware is pure recrystallised alumina (over 99.9 per cent. Al_2O_3) and the upper working limit of temperature is $1,950^\circ\text{C}$., almost twice that of vitreosil (pure fused quartz or silica) made by the same firm for over 30 years. Beakers, crucibles, tubes, etc., are exhibited. The new mercury discharge burners are especially noteworthy for robustness and handiness. In these respects alone they are infinitely superior to the older arcs which contained a considerable amount of mercury in the evacuated envelope and were subject to mercury hammer, rendering them exceedingly fragile. One exhibit in particular, a laboratory outfit comprising an incandescent cathode discharge burner operated from a compact electrical auxiliary unit, indicates to the visitor the advantages of the new type of ultra-violet equipment, namely, robust construction, transportability, ability to be used in any position (arcs were limited to the horizontal or vertical), and convenience of

starting on the switch (thereby eliminating tilting to start as with the arc form). To enable users to choose a burner suitable for their particular requirements the makers can provide spectrum analyses of all burners. These mercury burners, moreover, have envelopes of fused quartz (Vitreosil) which allows the maximum transmission of ultra-violet light of any manufactured material down to $1,850\text{ Å}$.

The Tintometer, Ltd.

(Stand A. 79)

THE Lovibond tintometer (British Drug Houses pattern), the Lovibond comparator for the colorimetric determination of the pH of solutions, and the B.D.H. Lovibond nessleriser for colorimetric analysis are being exhibited by The Tintometer, Ltd.

Thomas Tyrer and Co., Ltd.

(Stand A. 206)

OF the very extensive range of chemical products manufactured by Thomas Tyrer and Co., Ltd., it is only possible to exhibit a number of typical examples serving to indicate the wide scope of this firm's activities. They are exhibiting a number of technical chemicals, which find application in industries such as the oil, paint, rubber, photographic, cosmetic, ceramic, etc. The firm specialises in the manufacture of bismuth salts, including the carbonate, subnitrate, salicylate, etc. Particular attention is drawn to the carbonate, which is shown in all densities, from "extra light" to "heavy," also to bismuth sodium tartrate in scale form, the composition of which is so regulated that the best results are obtainable when dispensing.

Thomas Tyrer and Co., Ltd., are among the well-known manufacturers of "driers"; samples of these products which are exhibited include acetates, naphthenates and linoleates of cobalt, manganese, lead, etc. A material of increasing use and importance in the oil and paint industries is aluminium stearate, which finds application in lubricants, greases, candles, polishes, paints, printing inks, cement, etc. Among products exhibited for the rubber trade, are cadmium and zinc sulphides, also zinc stearate. Zinc, magnesium and calcium stearates are specially manufactured for cosmetic and allied purposes.

Whiffen and Sons, Ltd.

(Stand A. 181)

THE exhibit of Whiffen and Sons, Ltd., consists in the main of iodides, bromides, strychnine, caffeine, emetine, salicin, atropine, quinine salts, camphor, vermilion and essential oils, which are shown in the well-known forms for which the firm is famous. Another product of interest is known as Z.A., or chemically as p-diazodiphenylaminesulphate. This substance can be used in the preparation of diazo papers so largely employed in the reproduction of plans and scale drawings.

Williams (Hounslow), Ltd.

(Stand A. 177)

THE very wide range of dyes exhibited by Williams (Hounslow), Ltd., indicates that the number of industries into which dyes enter continues to increase tremendously. It is impossible in the space available to mention more than one or two of the more outstanding lines, but special reference may be made to the beautiful range of shades displayed in candles, and to the comprehensive series available for all classes of wood stains. The shades on view are really true reproductions of the various woods which they claim to imitate and are calculated to satisfy the most critical of experts. There is also a display of many different kinds of confectionery and food, whose appearance is wonderfully attractive as a result of the use of the special harmless colours in which this firm specialises.

Modern Welding Methods in Works Maintenance

By C. W. BRETT, M.I.W.E.

THE mechanisation of any industry invariably speeds up production, reducing costs and giving a uniformity of result otherwise impossible. At the same time, mechanical appliances, however simple, call for intelligent treatment and even the most perfectly built machines are liable to failure. Breakdowns are always expensive unless they can be handled expeditiously, and it is unfortunate that in the urgency of the moment those who are responsible for getting plant running again are apt to accept the first suggestion to be offered. If it were known that certain means existed whereby a repair could be made not only permanent, but in many instances resulting in a fractured part becoming even better than before, obviously such an opportunity would be taken.

Welding as a means of repair is not of recent origin, but the main purpose of this article is to indicate some entirely new scientific methods which are enabling fusive engineering work to be used much more extensively than has hitherto been possible. Examination of the records of major repairs carried out upon machines which are of vital importance to a manufacturing process makes it overwhelmingly evident that by no other method than welding could the breakdowns have been overcome with so little loss of time.

Due to an act of carelessness on the part of the operator the massive frame of a multiple press was badly broken. This happening was particularly unfortunate because production was entirely dependent upon this unit of the factory plant. A replacement was out of the question as it would have taken several months to procure, and it was decided to attempt a welding repair. The maintenance engineer was a little doubtful as to the result because of the magnitude of the task and a lack of knowledge of the great strides which have been made recently in scientific fusive engineering. Fears as to the outcome, however, were set aside when a comprehensive guarantee was given before the work commenced. A squad of picked operators working in relays accomplished the task in a remarkably short space of time, and, moreover, the work was done so neatly that the closest examination was needed to trace any evidence of the repair. This press has now been in daily service for several months, and there is not the slightest reason to fear further failure in normal working for the repair has made the broken part stronger than when it was originally cast.

In the case which has been described the owners resorted to welding because it appeared to be the only solution to their difficulties, but had the fractured component been smaller and a replacement part readily obtainable, it is probable they would have paid a substantial sum of money and fitted a

new part without realising that welding costs roughly one-seventh of the sum required for a renewal, whilst the loss of time would have been greater.

Apart from constructional work, which does not enter into the scope of this article, it is commonly supposed that the only other service which can be rendered by welding is the repair of *broken* parts. For this reason maintenance engineers frequently overlook the important possibilities of fusive work as a means for renewing *worn* surfaces. For example, crankshafts and other highly stressed items of machinery, which have become scored or otherwise badly worn in service, can be brought back to their original condition quickly and cheaply.

There are several methods by which this particular work can be done, and it depends upon the metal and the service required as to which process is used. In the case of parts which must possess the utmost resistance to wear there is no difficulty in case-hardening after the weld has been completed. Sometimes when wear has been extremely rapid, indicating that the original material has not been the most suitable, higher grade metal is frequently deposited, thus effecting marked maintenance economies.

The manufacture of chemicals calls for highly specialised plant in which alloys must be used to resist corrosion or achieve other purposes. Materials of this kind are being handled constantly by scientific welding engineers, including the wide range of aluminium alloys and stainless steel.

By way of illustrating the means whereby welding costs have been sub-

stantially reduced, brief mention should be made of an entirely new process. The essential qualities of a repair are strength, accuracy and neatness. Although welding specialists have been able to guarantee the first and third requirements, there are instances in which it has been difficult to avoid thin sections of cast iron going out of truth. In the past, variations of this kind have been rectified by building up the component and re-machining to size, but obviously this increases the cost of the work. An entirely new method of welding which is specially applicable to cast iron and malleable parts is the Barimar low-temperature process.

This welding discovery is used for carrying out repairs in a definitely fusive manner, but at temperatures little higher than those commonly needed for brazing. The development involves an entirely new technique of manipulation on the part of the operator, and the use of a novel form of blow pipe, but the result is to localise the heat produced so that it does not pass to the surrounding body of metal and thus set up internal strains, which in unskilled hands can bring about the unhappy result mentioned. By the use of this pro-



The body and cover of this hydro extractor were cracked as the result of an accident. Although made of a special acid-resisting alloy, the welding engineers made a successful repair at comparatively small cost within a day or two. (Repaired in the Barimar Welding Works.)

cess, and irrespective of their size castings can be welded without pre-heating and with no risk of distortional troubles. In the hands of an expert operator the cooling off period after the welding has been completed need not be a lengthy matter, and no machining is necessary except to remove any surplus metal which there may be in the region of the weld, all of which facts are contributory to lower costs.

Those who have experienced the multitudinous problems which confront almost every works maintenance engineer in the course of normal duty, will have knowledge of the recurring type of breakage which is due to the inherent weakness of some particular part of a machine. Failure of this kind is at once evident to a scientific welding engineer, and in cases of this kind it would be futile to restore the faulty part merely to its original condition. By the judicious application of new metal, just where it will do the most good, annoyance of this kind can be overcome cheaply and permanently. Occasionally manufacturers recognising the advantages of such methods may send along large numbers of identical and new parts, the weakness of which had not been discovered until they had been put into service.

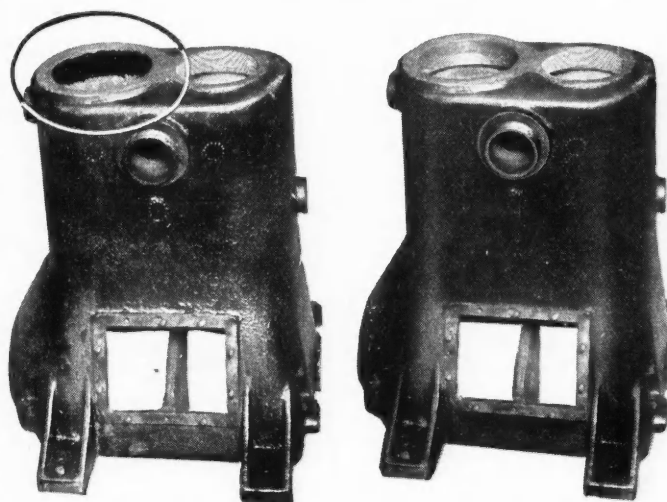
No reference to maintenance repairs would be complete without mention of the important service which is being

rendered by welding in the upkeep of boilers. Riveted repairs imply a lap joint upon which scale is deposited, and this scale being a non-conductor of heat causes unequal

expansion and contraction which sooner or later leads to leakage. In the case of a welded repair a butt joint can be made presenting an even surface both inside and out. Not only is this method of repair cheaper than riveting but the result is permanent and does not require further attention.

In the past, exception has sometimes been taken to the fact that machined parts which have been welded almost invariably reveal the effects of the oxy-acetylene flame. This is due to the superficial pitting of the surface which tends to mar the result when high finish is required, without in any way detracting from the strength. These tiny surface marks are due to oxygen in the atmosphere acting upon the molten metal. It is not easy to eliminate oxygen, although it is a well-known fact that electric arc

welding could be carried out in a hydrogen "field," but it has not been possible to do this on a commercial basis until quite recently. Nowadays when a high degree of finish, together with a virtually invisible weld, is required the work is carried out within an envelope of hydrogen which is produced by the coating on the welding rod or supplied direct from a cylinder.



Pneumatic power plant is being used to an increasing extent in industry. A connecting rod broke in these air compressor cylinders and the piston smashed the large valve seat at the top of the bore. An attempt to screw in a new valve seat failed because the metal collapsed and exposed the water space.

In spite of the further work due to the failure of the mechanical repair the cylinders were put into perfect order by scientific welding. The welded metal was of such excellent quality that a fine thread was cut in it to suit the screwed cover plate. (Repaired in the Barimar Welding Works.)

The Five-Day Week in Industry

Its Relationship to Planned Efficiency

THE five-day week in industry was the subject of the post-prandial discussion which, as usual, replaced the conventional toast list at the annual dinner of the British Chemical Plant Manufacturers' Association at Jules Restaurant, London, on February 6. Mr. J. H. G. Monypenny presided, and the principal guests were Mr. B. A. Bull, production director of Boots Pure Drug Co., Ltd., who introduced the discussion; Lord Leverhulme, president of the Chemical Engineering Congress; Mr. G. S. Whitham, of the War Office; Mr. F. Cooper, of the Import Duties Advisory Committee; Mr. L. W. Meekins, American Commercial Attaché; Mr. E. Wallace, chairman of the Association of British Chemical Manufacturers; Mr. J. R. Lane, president of the Association of Tar Distillers; Mr. W. A. S. Calder, president of the Society of Chemical Industry; and Dr. Herbert Levinstein, president of the Institution of Chemical Engineers.

The CHAIRMAN, in welcoming the guests, said that the Chemical Engineering Congress of the World Power Conference, over which Lord Leverhulme was to preside, would be, so far as he knew, the first of its kind. The congress would afford an opportunity to talk over technical matters, but from the point of view of the British chemical plant

manufacture its prime object would be to put this country right in the forefront of the chemical engineering world. Some 48 countries would be sending representatives and nearly 150 papers covering the whole range of chemical engineering had been arranged for by the technical committee, over which Mr. W. A. S. Calder was presiding.

Practically the whole of the available space for the exhibition of chemical plant which the Association was organising in conjunction with the congress had been booked, and the Department of Scientific and Industrial Research had undertaken to organise an exhibition of its own in one of the small halls, covering the work of the department and its various industrial research associations in so far as that work bore upon chemical engineering.

Mr. B. A. BULL, who apologised for the absence of Lord Trent, said these were days of rationalisation, or, as he preferred to call it, planned efficiency. Mechanisation, the function of management, which was beginning to operate more forcibly, comprehensive schemes instead of patchwork, functional lay-outs, the evening up of loads, the substitution of continuous for batch processes and other factors were piling up, without undue effort on the part of the operative, more and more products. Other influences were pushing up the out-

put per operative, and as this process was going on they were getting a vast problem of unemployment. Was it right that these changes should be going on? Was it a proper thing, which was for the benefit of the community? He suggested that if the benefits derived from planned efficiency were distributed equitably between the four parties affected by industry it was a good thing for everyone. The four parties interested were the consumer, the employee, the management and the shareholder or owner who provided the capital. He had purposely put the consumer first, for if they could bring down costs and increase output per operative it was right that the consumer should have some benefit. He had put the employee second because he thought the employee had a claim to the benefits provided in this way.

Uneconomic Saturday Work

The consumer should obviously benefit by a reduction in the price of the finished article. The best way to give the benefit to the employee was by shortening hours. If the whole of the benefit was passed on in the form of increased wages they would possibly get an accentuation of the problem of want in the midst of plenty. He did not suggest that production had outpaced the needs of the people, but distribution had not kept step with production. With things as they were the time was inevitably coming when they must cut down hours and share out the work that was there to be done. If they agreed that hours must be cut down, they must next consider whether it was better to have shorter days or a smaller number of days per week, and a number of factors entered into that consideration. If existing hours per day were long there would be an advantage in reducing the number and continuing to work the same number of days per week, but in most enlightened firms to-day the hours per day were not excessive; in those circumstances there were strong reasons for cutting down the number of days per week. The half day's work on Saturday could never be an economical proposition. The time worked was not fully productive, in fact, Saturday morning lost about half its quota of work based on the other days of the week. There was also the management point of view that by closing down on Saturdays a material saving in services—power, heat, steam, vacuum, compressed air, etc.—could be effected.

Some Essential Safeguards

With the five-day week, certain safeguards were essential. Obviously it was not desirable to work five days and give the workpeople a long week-end if they were going to accept temporary employment during that time and do someone else out of a job. Another factor requiring safeguards was the matter of overtime. Unless the five-day week could be introduced without continuous overtime it would be more rational not to shorten the week at all.

There was great difficulty in assessing the effect of the five-day week in any firm in which continuous reorganisation and continuous efficiency control were exercised. It was almost impossible to divorce the effects of rationalisation and planned efficiency from the effects of the shorter working week. With regard to the efficiency of the worker, his company had kept records which it had tried to bring down to a common basis for purposes of comparison. In the early months of working the five-day week they found they had reduced hours of work by 10 per cent. Their production per employee per hour went up, but not sufficiently to counteract the 10 per cent. reduction in hours. It went up sufficiently to counteract 7 per cent. of the 10 per cent., so that it cost them 3 per cent. of the total output to put the five-day week into operation. If they had not anticipated that it would cost them something, and if they had not, in fact, passed something on to their employees all their talk at the time the five-day week was introduced would have been humbug. One important factor in their own particular case was reorganisation at the opening of the new Beeston works. In that case their total wage bill went up during the period from immediately before the works were opened until the period

immediately after the five-day week came in. Their wage bill went up 2 per cent. and output went up 52 per cent. They were faced with the problem of either shortening hours or finding an immediate and permanent increase in business of a very substantial character, or of dismissing a number of employees. They decided that their best method was to shorten hours, but then they had to consider a number of sections, employing large numbers of people, who were not affected in the same way.

They decided that so far as the production staff, the office staff and the warehouse staff were concerned they would make the five-day week general, and they made some surprising discoveries. The accountant's department said that as hours shortened hours, but then they had to consider a number of per cent. more staff, but after a month it was found that the department not only got through its work, but got through it earlier, without any increase in staff.

The Sociological Aspect

In his opinion, where planned efficiency was being effected the five-day week could be introduced without extra cost, provided the two things, planned efficiency and shortening of hours, were taken together. A good deal of the academic research going on with regard to industry was, in his mind, not worth the paper it was written on because conditions were not comparable, and it was impossible to say to what any particular results were due.

With regard to the sociological aspect, they had only had 18 months' experience, and there were fluctuations from time to time so that they could not say a decrease in sickness absenteeism was due to a particular cause. In a section comprising well over a thousand people for which they had actual comparable results for ten years they had found that, compared with April, 1934, the last month before the introduction of the five-day week, every succeeding month had been a record in reduced sickness absenteeism. With regard to the habits of the people, he thought they had to face the situation that, with the shortening of working hours, leisure was going to become an important thing in the life of a larger number of people. The improvement of leisure was going to have its repercussions on industry. It would create demands which would have to be met, to the benefit of everyone. One of the benefits they had found at Nottingham was that on Saturday mornings the company's shops were much fuller than they used to be, and the business which used to be very heavy on Saturday afternoons and evenings had been spread over the day.

The Question of Service

On the question of service, Mr. Bull said they had made inquiries as to whether the five-day week had in any way depreciated the services which they were giving to their customers and they had not been able to find any evidence that that was so. They had had to make special adjustments in the case of the special skeleton staff which had to be on duty, and they had arranged for them to have alternative time off and so avoid overtime.

The psychological effect of the five-day week was undoubtedly good. The workman arrived on Monday morning fresher and with more zest. It was a good thing to wake up on Saturday morning and to feel that one was free from work until Monday morning; it was very different from starting the leisure period with a feeling of tiredness after Saturday morning's work.

How far the principle of the five-day week could be extended depended largely upon the way in which it was regarded. Many firms who looked at the question with an open mind and with goodwill could make a success of it. In this world one of the greatest rewards that could come to anyone was the satisfaction of a job well done, and if they looked at the question with goodwill there was a great chance of their getting great satisfaction out of it.

(Our report of the discussion which followed Mr. Bull's address is unavoidably held over.)

Maintenance and Repairs of Grinding Machinery

By W. A. STAPLETON

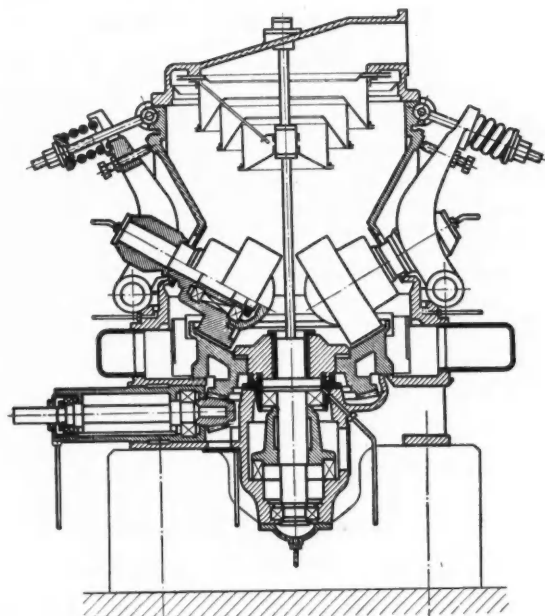
THE maintenance of grinding machinery is of great interest to plant engineers at the present time, because it is a well-known fact that special steel manufacturers are devoting themselves to the necessary supply of particular alloys which will give the greatest life possible under heavy duty conditions. For instance, it has been found from actual experience that even by using Stellite on manganese steel grinding tips or hammers, the life of the parts has been easily increased four times on semi-abrasive materials, but naturally on more abrasive products the life is proportionately lower.

It is well known that the cost of maintenance and repairs for grinding machinery is now receiving very full investigation by manufacturers installing plants, so that when arriving at the finished cost per ton all-in of a given material the maintenance and repairs factor is made very clear in order that a complete check can be made in comparison to the initial cost of a certain machine.

It has already been established that a machine should be

production in pounds, shillings and pence should also be added to the full cost of maintenance and repairs.

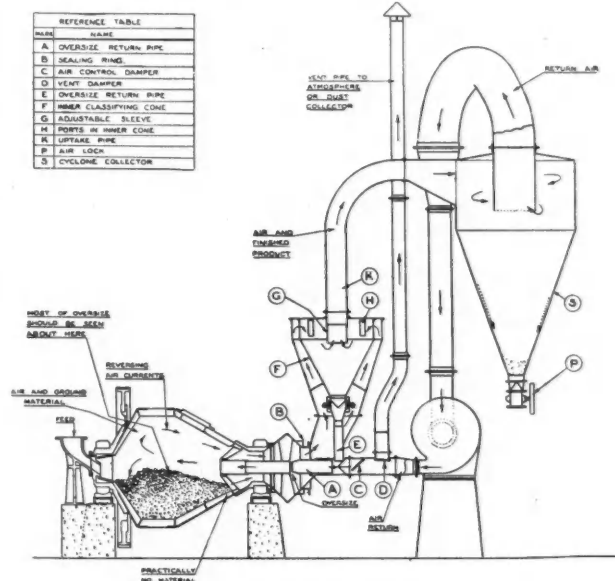
Incidentally, in many cases where making comparison of



Medium-Speed Roll Mill with Air Separation.

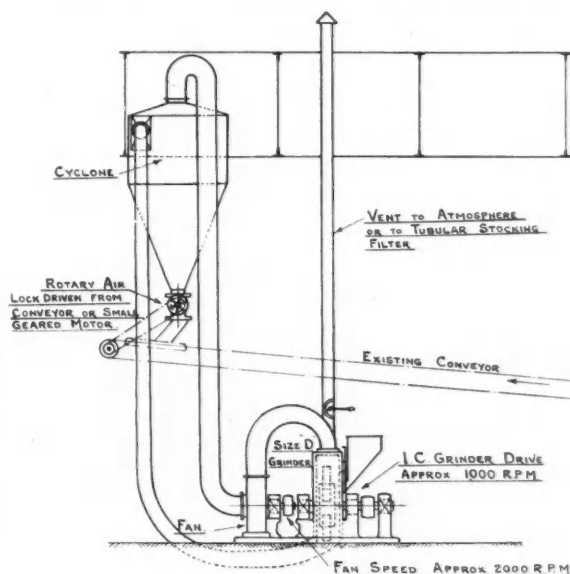
selected for the full duty it has to perform. For instance, when grinding coke to a fine powder, the cost of maintenance and repairs should be thoroughly investigated to make quite sure of the correct selection of machines and auxiliaries. Slow speed machinery is indicated when treating this class of material in order to arrive at the lowest all-in cost per ton of finished product. For instance, a slow speed ball mill will take approximately 10 h.p. per ton more to grind to a given mesh, than a medium speed roller mill, but the effect of the abrasiveness of this material when being ground on the roller type mill increases the cost of maintenance to such an extent that it out-weighs the extra horsepower required to drive the ball mill.

When considering the ball mill, special selection of grinding media should be made to give the longest life possible. On this type of mill the make-up ball charge can now be inserted whilst the mill is running; in contra-distinction to this, it is usual to stop the roller type mill in order to replace parts that are worn. Therefore it will be seen that the loss of



Slow-Speed Conical Bar Mill, Air Swept.

cost of repairs, the very important item of labour for carrying out the repairs is entirely left out. It will be readily understood that some machines are much more accessible than others, and the labour cost to take apart and re-assemble should be investigated, as it takes much less time if the mill



Disintegrator with Closed Circuit Air Conveying System.

has been designed to take care of this item. This is cited because on one particular mill a complete door frame is arranged which carries the roll and pendulum, and the door

can be thrown open, exposing the roll for effecting a quick repair whilst the mill is running.

There is also a very interesting point concerning roller mills. It has been found in practice that rolls made of chrome steel will give a longer life than if supplied in chilled iron. This is due to the fact that the chrome roll can be re-buffed, and the maximum life and running efficiency can be obtained from each roll. This, of course, also affects the life of the grinding ring upon which the rolls crush a given material. It is well known that providing the rolls and the ring retain a flat surface, the capacity and fineness remains consistent. It can be well imagined that in the event of the grinding ring and rolls becoming somewhat corrugated the grinding effect drops off, which lowers the capacity when the machine is set for definite fineness. The speed of mill is also very important. Many mills run 10 per cent. faster than is actually necessary.

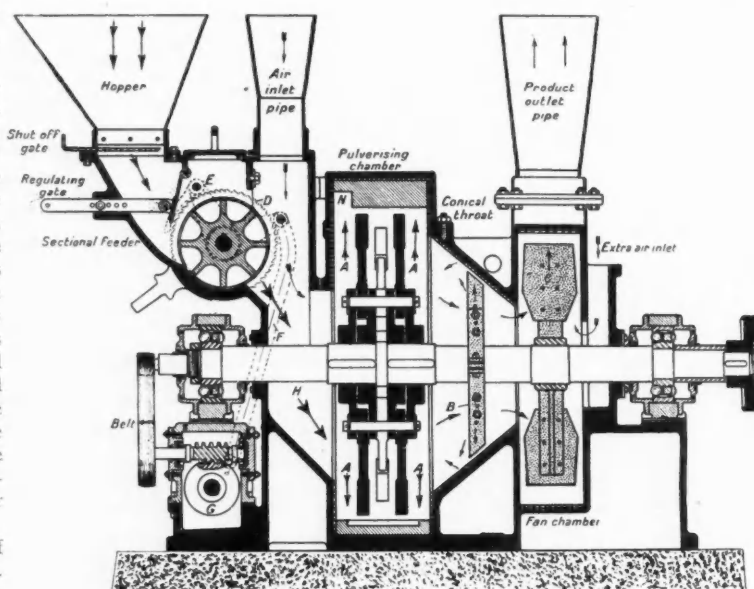
Another important point is lubrication of the running parts fitted to grinding machines. Certain materials when ground create a higher temperature than others. This directly affects the properties of the lubricant used. A very close study has been made in connection with grease and oil lubrication for particular sections of the grinding installation. To-day this subject is receiving very much interest, because quite a number of milling installations are

now running under conditions where hot air is introduced into the milling system for drying the material whilst it is being ground. Here again, the important question of maintenance comes into the picture, because special attention must

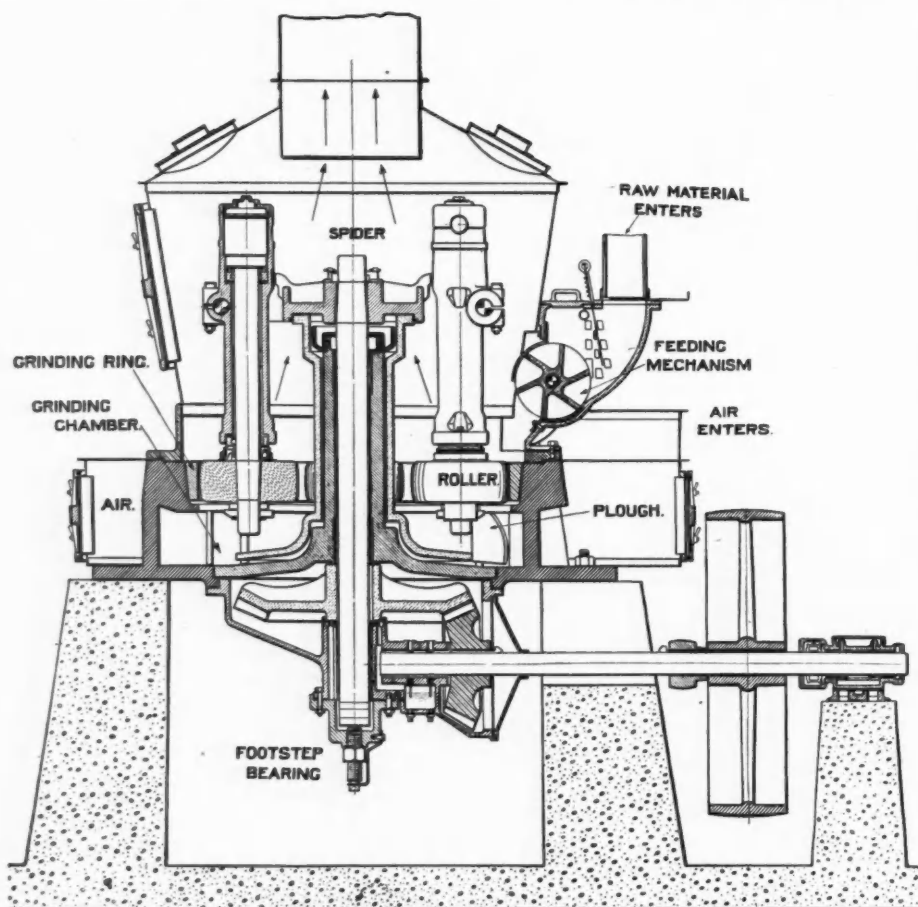
be given to the running parts which come into direct contact with hot gases.

The design of a roller mill pendulum must be such that lubricant cannot be allowed to leak through any part of the pendulum arms. This necessitates special precautions as regards the fitting of packing rings of special material, to take care of the expansion and contraction of the oil, as it will readily be seen that when the mill is running under normal conditions, with hot air introduced into the system, a different set of conditions will take place when the mill is shut down and the oil, etc., cools off. Therefore, by paying attention to this particular part, the maintenance costs are kept down to a minimum.

It has also been found out by experience that quite a number of engineers have been satisfied to run their plant until the unit requires a general overhaul. This is a mistake in most cases, because it has been found upon inspection of one part of the grinding media, heavy wear has taken place, and if new parts had been supplied months before, the user would have obtained his maximum capacity for



High-Speed Impact Hammer Pulveriser with Air Separation.



Centrifugal Roller Mill with Air Separation.

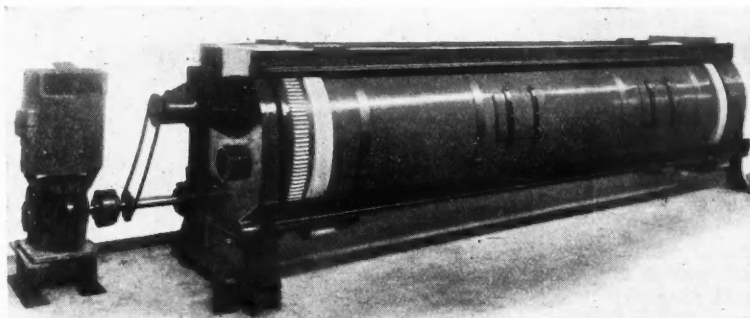
the expenditure of only a few pounds. When investigating the all-in cost per ton, it will pay to study the complete maintenance and repair costs by selecting, in the initial stages, the most suitable machine for the duty required, whether it be slow speed, medium speed or high speed mills, this depends entirely upon the characteristics of the material to be treated. It is false economy to install a machine because it is cheap in first cost, and users can take full advantage of manufacturers of milling equipment who have had well over half-a-century of milling experience. Selection of a plant using air separation in closed circuit has been preferable to an open circuit grinding machine which has the effect of creating dust. A dusty machine causes wear on bearings, belts and adjacent

machinery, which, of course, must also be taken into account when considering the maintenance, apart from having the grinding room with a healthy atmosphere for the operatives. One of the most recent developments has been in connection with disintegrators. These machines can now be obtained linked up with air separation in closed circuit, with the fan arranged in such a manner as to bring the material from the grinder into the cyclone under suction. This relieves the fan blade wear and at once brings down the costs of maintenance.

The accompanying illustrations show a slow speed ball mill, medium speed roller mill, high speed Impax pulveriser, and the new development of linking up the disintegrator with air separation.

Maintenance of Dryers

By L. A. MITCHELL, M.I.Chem.E.



Fixed Tube Steam Heated Dryer.

IN the days of brick-built dryers with steam-heated shelves, and brick tunnel dryers, with stagnant air, the matter of replacement of iron shelves, supports and doors was serious, as it usually involved cutting away and replacing brickwork also. With compartment dryers, with hot plate floors or steam pipes or radiators, there were usually few repairs, but the rate of drying was slow and the volume efficiency very low. The years since the great war, however, have seen great advances in the design and construction of drying plants, and modern dryers may be divided into the following classes: (1) Compartment and tunnel dryers, (2) rotary dryers (horizontal and vertical), (3) flat bottomed pan dryers with rotating scrapers, (4) vacuum ovens (shelves and trays), (5) vacuum ovens for solvent recovery, (6) film dryers, and (7) spray dryers.

Compartment and tunnel dryers convey pictures of the original brick-built dryers with rails for trucks, and drying by combustion gases, or air heating by pipes laid along the floor. To-day these are built with sides and roof of sheet steel panels with asbestos insulation. They are light and arranged for erection in sections. The tunnel dryers can have counter air flow with air entering at the dry material end or parallel flow with air entering at the wet material end.

Low Costs of Repair.

Recirculation of part of the air is usual, and the amount of this is adjustable by baffles, to enable it to be controlled to suit the outside atmospheric conditions. The repairs and maintenance costs of these are very small, and with temperatures around 100° C. they are practically nil on the ovens. The trucks are usually pretty roughly treated, and those types which do not run on rails are frequently in collision with oven sides, pillars, etc. The wheel and swivelling ball bearings rarely receive sufficient attention to keep them working easily and steerable. Those trucks which run on rails through tunnel ovens do not usually require so much repair.

Compartment ovens which are distinguished from tunnel ovens by the fact that the trucks are entered through doors at the side and do not travel in the oven are frequently used for articles which can be handled on trays. The air usually flows longitudinally and recirculation is necessary, otherwise

those trucks at the end of the air circulation would act as condensers for the moisture from those trucks at the end where the air enters.

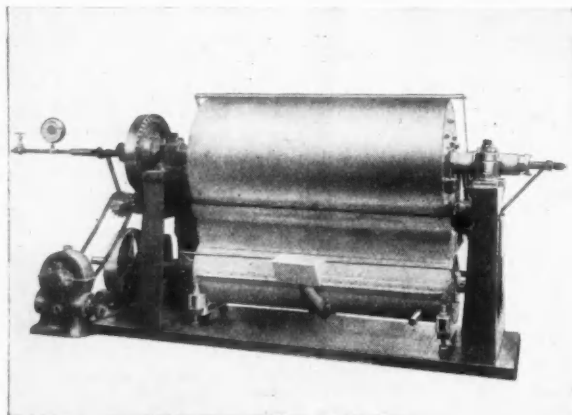
There are many combinations of the truck arrangement from having all trucks in series, to those with two or even three rows of trucks in parallel. This type includes the single compartment dryer having room for only one truck, and by far the majority are comprised in those having one, two, three or four trucks. The one-truck type can usually be expected to give about 1½ tons dry material per week, and hence, where one firm makes a large number of different products, considerable numbers of one and two-truck stoves will be found.

Rotary Dryers.

The term "rotary dryer" covers a wide variety of plant, and the individual units are usually large, ranging in size from 3 to 10 or more feet in diameter, and from 12 to 80 feet in length. Portland cement dryers are in a special class, and may go up to 200 feet long. The common feature is that the dryer body is a mild steel cylinder with outside rolling rings, and they are rotated slowly by heavy gearing. The methods of heating and applying the heat are very varied, including coal or coke solid fuel, oil, gas, waste products, etc., firing. Others are provided with tubular steam heaters for the air. The cylinders frequently have lifting vanes or framework inside to ensure the best drying conditions, and also to balance the cylinder, and reduce the load on the driving gear.

The gases or heated air may pass directly in contact with the material being dried, or heat the outside of the cylinder, or pass through tubes inside (indirect heating). These dryers are frequently provided with cyclones to prevent the escape of dust. The steam-heated dryers have usually a lower repair cost than the direct fuel-fired dryers, but have lower drying temperatures and are larger in proportion to the work to be done. The repairs to the fuel-fired dryers are usually higher, and are generally connected with the furnaces or burners, and with the sealing rings at the ends of the cylinder. Both fuel and steam-heated dryers are likely to have in-

creased wear and repairs to the gears of the larger sizes, if they are long enough to require three or four rolling rings, and if sinkage of any one of the foundations of these rings occurs, causing bending of the cylinder. This will produce heavy additional work on the rotating gear. With only two rolling rings this point does not arise.



Film Dryer fitted with special type of Spray Feeding Device.

Fixed cylindrical dryers with rotating scrapers are usually made with steam jacketed bottoms and sides, sometimes with steam jacketed bottoms only. They have scrapers slowly rotating horizontally to scrape the bottom and to stir the material to facilitate drying. The scrapers are arranged to discharge the material through bottom or side doors when these are opened. Too deep a layer of material is a disadvantage as it prevents the escape of vapour. The scraper should thoroughly stir the surface layer as well as the bottom.

a screen to prevent dust from leaving the dryer. The loss of vacuum will be about the same with either, as the filter

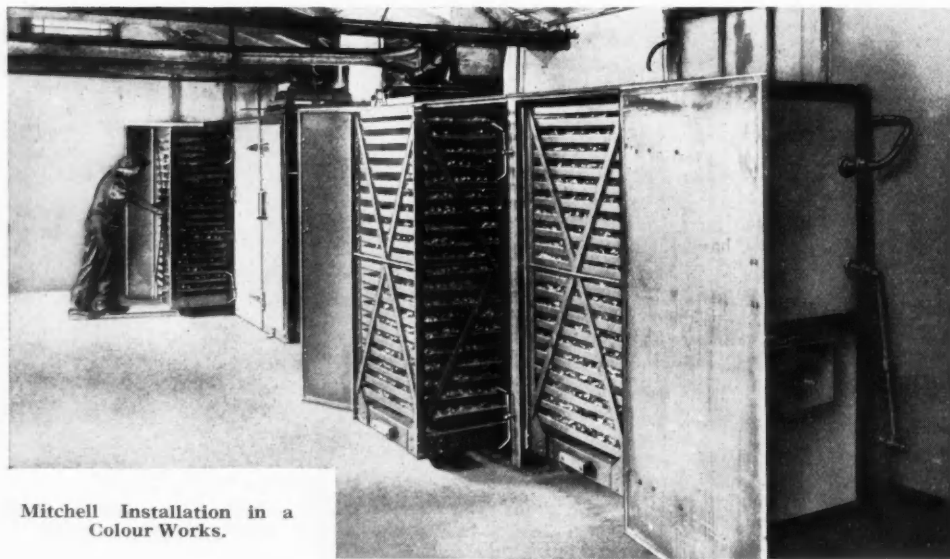


Steam Heated Hot Plate Dryer.

screen generally chokes quickly. Screens, if used, should be easily accessible for cleaning.

Vacuum Ovens for Aqueous Liquors

Vacuum ovens for aqueous liquors are almost invariably of heavy cast iron construction, with steam heating from hollow plate or pipe coil shelves. Some makers use mild steel round pipes coiled to form supports for trays. These are theoretically wrong, as there is contact between coil and tray



Mitchell Installation in a Colour Works.

The chief repair item in these fixed cylindrical dryers is to the scrapers which have to be made to scrape the bottom closely and should also scrape the side. If made to bear on the bottom too closely the bottom also will be worn, and if rivet heads are in the bottom the safety may be seriously reduced before it becomes noticeable; when the bodies are of aluminium, copper or other soft metal, this point is of even more importance. When these dryers work with vacuum, difficulty is frequently experienced in preventing dust from choking condenser tubes, and it will frequently be found better to use a simple centrifugal separator rather than

at only a few points, and the heat conduction is very bad. Other makers, to avoid this, flatten the tubes on the top to give a semi-circular section with flat top. This can only be a "talking point," as the whole coil is never really flat and contact is still only on a few points.

Even the usual tray shelves are poor from this point of view, as the mild steel hollow plate shelves are not flat on top and the trays are not flat on the bottom. The only correct arrangement is to have plates and trays machined. When this is done, one could expect to get the best results from vacuum ovens. These ovens have no air circulation and

many are so arranged that condensation falls on to the top tray. The ovens suffer very badly from corrosion when used for drying acid pastes. They are frequently used when the material will not permit the use of higher temperatures, though it has not to the writer's knowledge been proved that they are better than atmospheric tray and truck ovens (compartment and tunnel dryers), heated with hot water in the coils in lieu of steam. Where the vapours are offensive, explosive or inflammable, they are preferable.

The chief items calling for repair or renewal are the shelves, trays, pipe connections inside the oven, and the door jointing. The cost of renewal of trays is also heavy, as enamel chips, while copper and aluminium bend easily, and give very poor contact with the shelves. The vacuum pump packing is also frequently a source of trouble, especially with acid material drying.

Ordinary vacuum ovens are frequently used for solvent recovery, but it is decidedly better to design a special vacuum oven. The bottom and top should be dished to the centre, the bottom to run liquid through a pipe to a catch box, and the top to drain condensate to the sides away from the trays. The shelves should be steam heated and the sides water-sprayed on the outside, while the top should even form a shallow open surfaced water tank. Material once evaporated will then go either as liquid directly to the catch box or as vapour to the condenser, and so avoid condensation and re-evaporation. An asbestos base material must generally be used for door jointing. The same principles should guide the shelf and tray design as for ordinary vacuum ovens.

Film Drum Dryers

The chief troubles as to repairs will generally be with the the vacuum pump stuffing box and sometimes with the piston rings, as the solvent will destroy the lubricant. Some solvents, such as nitrobenzene, however, have good lubricating properties.

Film drum dryers are made with either one or two drums. In the first case the drum dips into the liquid, which must be kept agitated to retain the solid particles in suspension. In the second case, the liquor is fed into a trough formed by end plates in the space above and between the drums. The output of these dryers is relatively small, as they are generally used for liquid materials with a very large percentage of water to be evaporated. They are occasionally made to work with vacuum, when the vapours are dangerous.

On ordinary aqueous materials the repairs are small, but with acid or corrosive liquors repairs and renewals may be heavy, owing to corrosion of the drum surfaces, and the vacuum pump if used. It is difficult to avoid this owing to the great variation in the acid strength as the material dries on the drum.

Spray Dryers

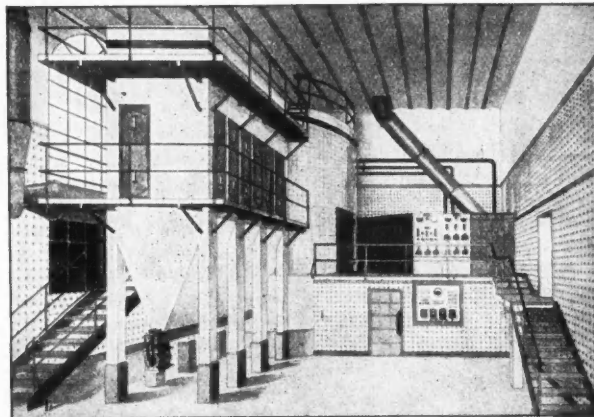
Spray dryers are generally used for very special cases, in which the materials should only be subjected to low drying temperatures and even to those for the shortest possible time. A large amount of experimental work has been done on the design of the spraying arrangement, and many types are now made. The object of all is to give the finest spray possible with avoidance of choking by solid particles in the liquor. Some achieve fine spraying without actual tube

passages. In all these dryers the particles move through the air in large vessels, and the aim is to give time for evaporation and drying before they touch the sides. The product is generally found in the shape of small hollow spheres. Some have the sprays from the top and some from the bottom.

The part requiring attention is usually the high speed spraying device, and it should be arranged for easy removal for cleaning and repair. The filter bags on the final air discharge require to have a very large surface, as the fine dust produced by this dryer chokes them easily; also there is no re-circulation of the air and the volume to be discharged per minute is usually very large. The spray drying chambers are usually of sheet steel tinned on the inside, and the dryer does not have to handle acid materials.

The pumps for the liquor feed and the air supply do not usually call for any special repairs. Frequently, however, the best method of heating the air is a problem, as, while direct flue gas mixed in the air is the cheapest and the quantity required is large, this will usually give smuts in the product, and cannot be used for food products. It can be used for some materials, such as dye intermediates, if a filter or cyclone is used to separate out dust particles. Hence tubular fire or steam-air heaters are usually necessary and steam

heaters require large surfaces for the quantities of air required.



Zahn Ravo Rapid Spray Dryer.

Vegetable Oil Standards

Seven New British Specifications

SEVEN new British Standard Specifications for vegetable oils have just been issued by the British Standards Institution, in further development of the setting up of a comprehensive series of nationally agreed standards for vegetable oils. These specifications deal with crude maize (No. 651), crude palm kernel (No. 652), crude soya bean (No. 653), perilla (No. 654), refined cotton seed (No. 655), sesame (No. 656), and castor (No. 650), oils, and have been prepared by the special Vegetable Oils Committee of the Chemical Division of the British Standards Institution, which committee has been actively working during the past two years under the chairmanship of Mr. E. R. Bolton, F.I.C., M.I.Chem.E.

Limits are laid down in the specifications for impurities, colour, refractive index, iodine and saponification values and acidity, etc., and standard methods of test for determining these properties are included in appendices. The details of these tests, as in the case of the previously-issued standards for vegetable oils, have been arrived at after careful examination of existing methods of analysis, particularly from the standpoint of accuracy and reliability. The limits have been fixed by agreement between the principal users and manufacturers, and experimental work has been carried out by the committee in practical verification of the methods.

The specifications for vegetable oils issued by the British Standards Institution at the end of last year provided for raw linseed ground nut, coconut and rape seed oils, whilst a further specification dealing with the sampling of fats and fatty oils in packages or in bulk accompanied these.

Copies of the seven new British Standard Specifications can be obtained from the Publications Department, British Standards Institution, 28 Victoria Street, S.W.1, price 2s. 2d. each, post free.

Problem of Evaporator Maintenance

By a CHEMICAL ENGINEER

THE problem of maintenance and repairs for evaporators in chemical works may be an important item in the cost of production. There is, naturally, a wide difference in the cost of repairs in the case of difficult liquors which give considerable scaling, as against liquors with which no scale is formed and the tubes are easily kept clean. Usually the problem of maintenance resolves itself into the question of tube replacement, also the matter of leakage at the tube plates.

It is very noticeable to those who are thoroughly acquainted with this problem how the whole idea of evaporator design has been changed of late years, largely due to this problem of upkeep. In the early days, when the calandria type pan was the one most in use in chemical works, the tubes were very short, consequently the variation in length, due to expansion and contraction, being taken up in the tube length was not so easily provided for.

One of the great advances made due to the work of Paul Kestner was the bringing of the long vertical tube into prominence. Kestner was the originator of the use of vertical tubes seven metres long. The tubes when fitted into the calandrias are fitted horizontally so that there is a natural curve, or bend, in the length of the tube. Thus, when the tubes are in actual use, the expansion and contraction is easily taken care of without causing any extensive strain on the joints of the tubes themselves.

Advantage of the Long Tube

The other great advantage of the long tube is the reduction of the number of joints for an equal amount of surface. When the long vertical tube came into prominence the usual length of the tubes in calandria pans was four to five feet; so that by adopting the long tube the number of joints for

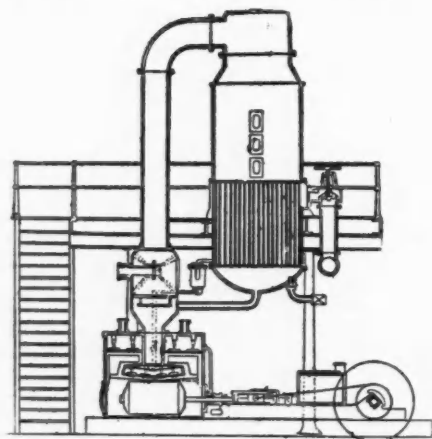


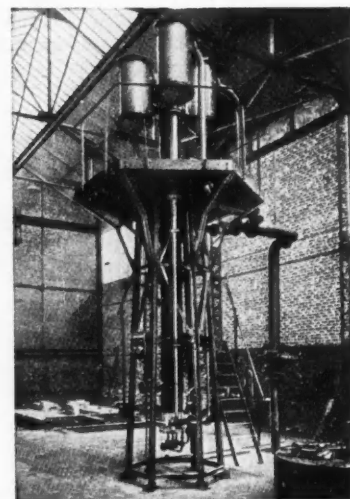
Fig. 1.—Old Type Vacuum Pan.

a given surface was from four to five times less, which makes a material difference in the opportunities for leakage and in the cost of repair and cleaning.

A further point in reduction of maintenance with long tubes is the ability to cut an appreciable length from any tube that has been removed for use in heaters, condensers, etc. It is usually found that tubes are not completely corroded throughout the whole length, and an appreciable further surface is thus obtained from the part of the tube that is so utilised.

The cost of cleaning tubes has been greatly reduced by the mechanical methods that are now available, operated

Fig. 2.—Kestner Patent Triple Circulation Evaporator operating without Vacuum and Extraction Pumps.



either by electricity, air or water; but, usually, the problem is approached from a different direction and processes are often able to be adjusted so as to prevent scale-formation and thus remove a very difficult problem in the handling of the evaporator. Apart from the question of tubes in an evaporator plant, there are very few repairs required, as the steam joints, and the like, are made in such a way that they go for long years without any attention being required.

The other direction in which evaporator plants require upkeep is in the matter of condensers and pumps. Where surface condensers are used, there again the question of scaling and dirt from cooling water has to be carefully looked into as well as the other annoying problem of growths of algae. These, however, are problems common to the power engineer, on which there is a multiplicity of experience available. As a rule, in chemical works the barometric or the low level jet condenser is the type most adopted as it is simpler in many ways and avoids a lot of the corrosion difficulties that may otherwise arise with various chemical liquors. In evaporators with short tubes, the low level type jet condenser is more generally adopted with its air pump.

Evaporation problems in the chemical industry involve dealing with liquors containing acids, alkalies and, often, gases, which give rise to corrosion in the air pump. A properly designed air ejector has eliminated the use of pumps, whether of the piston or rotating type, and forms a very economical method of maintaining the necessary vacuum.

Repair of Extraction Pumps

The extraction pumps for removing the concentrated liquor are often a source of cost for repairs, not only to the mechanical parts themselves, but also to the pump valves, etc. Here again, the long tube type evaporator can be installed so as to eliminate the need for extraction pumps of any kind, or for any air pumps, and up-to-date installations of modern design with the long tube evaporators form a highly efficient method of concentrating liquids with a reduction in upkeep cost that could not have been obtained in the earlier days.

It is very noticeable that Paul Kestner's original work has not only influenced the question of the length of tube but has also changed the old practice of calandria type pans, where the operator had to work inside the pan to get at the tube for repair. With the long tube the separator is away from the calandria, so that both top and bottom tube plates are easily accessible and the operator works in the open.

There is another modern development in evaporation which has been evolved with very considerable success where extremely difficult scaling and corrosive liquors are concerned. Here it is possible by a spray type evaporator, and utilising furnace gases direct, to obtain a high economy with low upkeep costs. This is a method that will be heard more of in the coming days.

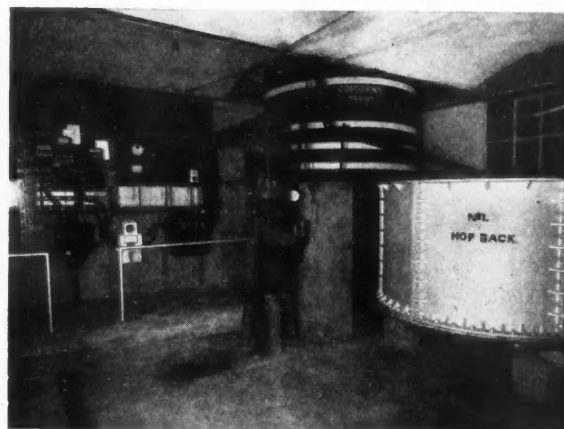
Electrical Steam Boilers and Their Application

By F. J. CAMPBELL ALLEN, A.M.I.E.E.

ELECTRICAL steam boilers are making steady, if slow, headway in this country; steady because the value and convenience of electricity is surely becoming recognised, slow because the public in general (which include the business man, the factory manager and the chemist) still think electricity is expensive, although where lighting or power drive is concerned, electricity is now accepted as the best, if not the only way.

There are, of course, any number of jobs for which the use of electricity for steam raising would be impossible with the present cost of generation and the existing rates of supply, and it is not unreasonable to ask why for some jobs electricity can be used, while for others it cannot; and the answer is this—it depends on the job. Every case must be considered on its merits. Take the case, then, of steam for process work in a commercial laundry. Here the work is spread out as far as possible evenly over the working week, large quantities of hot water are wanted daily and the daily load on the boiler is quite a good even one, which enables the boiler to operate under almost the best conditions, and, in consequence, with a reasonably high efficiency, and the difference in cost between that for coal and electricity cannot be met sufficiently by any savings on labour, in application of the heat for saving in space or amenities.

In a small laundry fitted in a shop selling high-class ladies' clothes there is a 120 kW boiler supplying steam for a calendar, washing machine, drying room and tubs. It is



120 kW. Electric Boiler as installed in a Brewery.

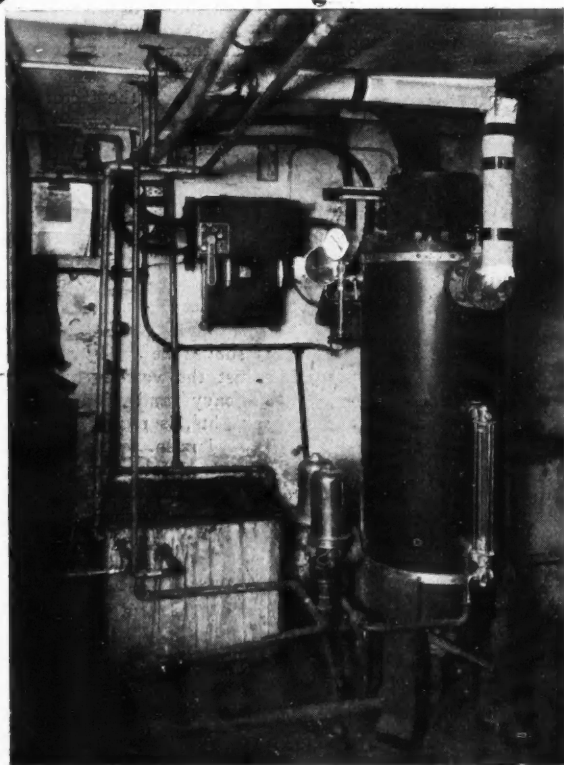
used nearly every day and on some days more extensively than others, depending upon the amount of work which is going through the shop. This costs about £100 a year. Coal would cost perhaps £30-£40 annually, but this boiler is operated entirely by the lady who manages the laundry, and, if a coal boiler were used, it would be essential to engage a stoker whose wages would amount to considerably more than the difference between the coal fuel and the electricity account. Incidentally in this case it would be almost impossible, owing to the situation, to get a coal boiler in at all; and thus, with the cleanliness, saving in fuel troubles, ash removal, and so on, electricity is clearly not only a commercial but actually far the best proposition. In a similar case in a small convent hospital the cost of a small 70 kW boiler supplying steam for a laundry, washing for 70 persons, including patients and staff, comes to only £1 a week.

Laundry and Brewery Experiences

The case of the small laundry shows that, apart from amenities, electricity is a saving, and here it is due to the saving in labour which would be necessary with a fuel boiler. There are other cases where saving on the fuel itself may be expected, and an example of these is the plant in a small brewery in Sussex. Three or four times a week—usually in the afternoon—steam is wanted for bringing 600-700 gal. of wort to the boil and keeping it there for an hour and a half. The wort is poured into the vat at a temperature of about 140° F. The units per brew average about 230, which, at 0.4d. per unit, is 7s. 8d. The features of this plant are the very small size of the electric boiler which, while only 5 ft. 6 in. high and 21 in. diameter, is capable of producing 400 lb. of steam per hour and, of course, being electric, can be placed right up alongside its job in the brewery with no troubles of fumes or flues. When steam is wanted, all that has to be done is to press a button, the pump starts up, water feeds into the boiler, steam is raised in a few minutes and is controlled automatically. As the owner says: "The way the boiler always maintains a constant steam pressure ensures an effective boil and good evaporation. The boiler shows a very real economy when used for steam-cleaning bottling and brewing plant, as steam can be raised for a few pence for this purpose."

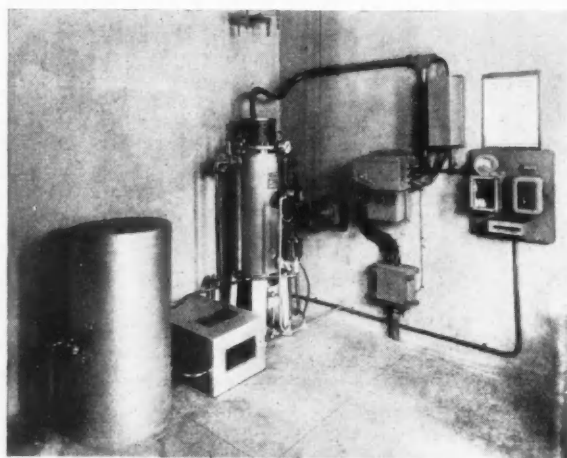
For work such as this electricity is almost ideal, and there are a great many cases in the industrial world where such boilers can be and are being used, such as in the dry cleaning establishment with the familiar drum turning round and round, which can be seen in almost every town, for distilling water, for providing steam for cooking, for heating the presses in knitting and clothing factories, and so on.

In most of this work a steam pressure of 80 lb. per sq. in. is necessary, but there is, of course, work where low pressure steam is all that is wanted, for instance, in sterilising



20 kW. Electric Boiler as installed at a Dry Cleaning Works.

chests, pasteurising plants and equipment for farm work. For this, a rather more simple type has been produced which works very well, although it has not the complete automatic



100 kW. Electric Boiler : A Typical Installation.

control features which are found with larger and more expensive boilers. The idea of this "farm boiler" is to have

in it sufficient water, which will take some two hours to evaporate, the boiler being filled by opening the feed cock when there is no pressure. By this means the expense of a pump is saved. The electrodes from which the current flows are supported by a float, and, in consequence, the electrodes being near the surface of the water only the upper layer of water is heated, and steam can be raised in a very short time. The load and steam requirements must be decided upon beforehand, the electrodes adjusted and then left. If a very fluctuating and intermittent steam demand is required, this can be controlled either by switching the boiler on and off, or by fitting a pressure control switch, which will prevent the working pressure being exceeded. This boiler, as its name implies, was designed principally for farm work, but it is suitable in all cases where low pressure steam, up to 60 lb. an hour evaporation, is wanted.

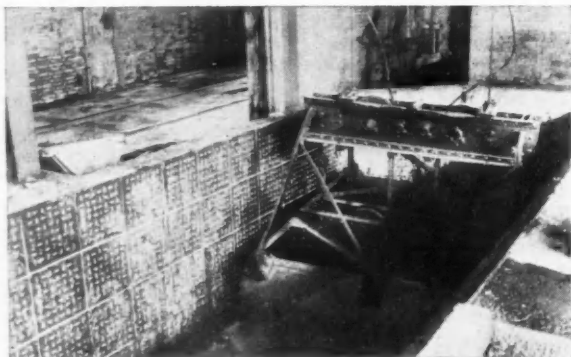
If the rate for electricity were low enough, then all steam would be obtained by this means, but this is not yet possible. Still, there are a large number of towns in this country, and in the Empire, where rates for day load for plants such as we have described are entirely satisfactory, these rates varying from 0.3d. to 0.5d. a unit, depending upon the size of the boiler, and the estimated consumption of electricity with, in most cases, the proviso that they must be switched off between 4 p.m. and 6 p.m., the normal hours of peak load on the electricity undertaking mains in the three winter months. As a rule, this interruption of supply causes very little inconvenience as the work can be arranged accordingly.

Factory Flooring for Rough Usage

How Maintenance and Repairs can be Eliminated

WHERE the ordinary individual sees merely the finished product, the chemist sees the ingredients that went to make that product; similarly, where the man-in-the-street sees merely a consignment of goods damaged in transit, a worn trolley-wheel, or three men straining to move

ing and vibration considerably shortens the period of use and places a terrific strain on the more delicate parts of the mechanism, and yet how often do factories try to overcome this loss by substituting more expensive rolling stock, rather than by providing a smooth surface over which the trucks would stand a chance of working as their makers intended them.



"Stelcon" Anchor Steel Plates are useful for Lining Fuel and Refuse Bunkers.

a not-so-heavily-laden truck, the works manager or engineer sees "worn floors."

Unfortunately the expert is not always consulted in the erection of new factories with the result that as far as flooring material is concerned a "penny-wise pound-foolish" policy is adopted, and an inadequate floor is installed with the result that soon after the new factory commences work the floor shows signs of wear and the factory starts losing money in many different directions. In some instances, the floor is not considered to be the cause of these losses, but in actual fact this is the root of the evil. For instance, rolling stock of any type cannot be expected to operate with maximum efficiency over uneven surfaces, where the constant jolt-

As soon as the factory floor becomes worn, the factory inevitably begins to incur losses through (1) the slowing down of transport, (2) the decreased efficiency of trucks, (3) the increased maintenance of trucks, (4) the increased labour required to drive trucks over an uneven floor, (5) damage to goods of a fragile nature through vibration and jolting, and (6) dust caused by the disintegration of the floor. Sooner or later, of course, the floor reaches the stage where it has to be repaired, with the consequent interruption of production through the re-direction and disorganisation of traffic and the stoppage of machinery.

"Stelcon" anchor steel plates should be used whenever a floor surface that is proof against the various forms of mechanical attack, such as very heavy and concentrated traffic or the dumping of heavy weights, is required. These plates are made of steel $\frac{1}{2}$ in. thick and 12 in. square and are laid in concrete, and are thus easily used for repair as well as for new work. On the surface of the plate and on each of the four sides fifty-seven anchors are punched with the object of allowing the air to escape when laying the plates, providing a grip, and rendering the floor absolutely immovable.

"Stelcon" steel clad flags are used for those floors which are exposed to heavy abrasive wear. Due to their special qualities and particularly to their great density, these flags are practically impervious to oil and water, and have been used with much satisfaction in sugar factories and refineries. The flags are made of highly compressed concrete, with a specially constructed steel face, the overall size being approximately 12 in. square and the total thickness 2 in.

Pipework for Modern Chemical Works

Some Useful Points Concerning Design and Maintenance

THE numerous and intricate processes involved in the chemical industry call for plant of efficient design, economical performance, and reliable operation. Not least in importance amongst the items comprising a modern factory is the pipework which is often extensive and costly, in some cases expenditure on the piping systems being between 5 per cent. and 10 per cent. of the total value of the plant.

The design of a pipework system requires careful consideration if maintenance costs are to be kept within reasonable limits. Pipework properly designed and installed should be practically trouble free, although it is a regrettable fact that in some factories renewal of pipe joints forms a large part of the maintenance staff's work. The arrangement of any main is a vital factor governing its subsequent performance; pockets (other than specially designed drain-

welded" mains and the elimination of bolted joints, valves and other fittings being welded into the mains. Two forms of welded joints which have proved satisfactory in a large number of installations are illustrated, Fig. 1 being suitable for high pressures and temperatures and Fig. 2 for more moderate conditions. For low pressures ordinary cross welding is sometimes adopted, *i.e.*, the ends of the pipes, suitably bevelled but not otherwise prepared, are welded together in position. Screwed and coupled tubing in sizes up to 6 in. is still extensively used for fresh water supply and gas distributing systems, and for many classes of temporary piping which have to be rapidly erected.

Protective Coatings and Linings

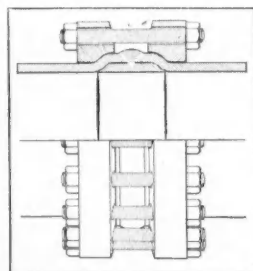
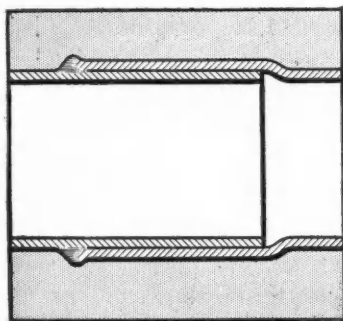
The development of protective coatings and linings has led to the replacement of cast iron by pipes of mild steel which are not so liable to fracture. Steel pipes with a lining of bitumen are now used for carrying water and where buried in the ground, are suitably protected with bitumen and hessian wrappings. The joints may be screwed and coupled or for the larger sizes spigot and socket or Victaulic joints. Gas piping is usually coated externally only and the joints may be welded or as provided for water piping. Steel piping is practically immune from the danger of breakage; it can be made in longer lengths (thus reducing the number of joints) and is lighter to transport than cast iron. It is seldom that cast iron is specified for steam mains nowadays, but it is regrettable that in some cases feed water mains in connection with boiler plant are still being made of cast iron, due to the apparent greater life under the action of corrosive water. It is often overlooked that the corrosion is merely transferred to another part of the system, and that the shocks to which feed water piping is often subjected render cast iron pipes liable to fracture.

For steam pipework systems, means must be provided for trapping and drawing off water carried in the steam or condensed in the pipes during the period of starting up, the accumulation of water in the latter case being responsible for most of the accidents occurring in steam mains. Hand-operated drain valves are usually all that need be provided to deal with this but where water is likely to be deposited continuously during operation, *e.g.*, in separators and receivers, automatically operating steam traps should be installed and by-passes fitted to permit these traps to be examined without shutting down the main. In some plants the steam traps cause no anxiety to the staff because they collect no water; there is a continuous escape of steam and water to atmosphere which, whilst causing no trouble, results in considerable waste. Where steam traps must be fitted they should be regularly examined to ensure that they are operating efficiently.

Waste of Steam

Where steam is extensively employed in process work it is not uncommon to find it wastefully used; the number of factories in which fuel is wasted in this way is truly astonishing. Much of the waste is due to defective fittings and although steam traps are probably the worst offenders, small cocks and valves (particularly the stuffing boxes of the latter) are points from which leakage is often observed. Much could be written on this subject, but it is sufficient to state here that all fittings are not suitable for steam (or other high temperature fluids) and that first cost should not be the factor governing their selection.

Where viscous fluids have to be transported, and it is necessary to maintain the temperature, steam and jacketed pipes form an efficient means. It is necessary to give close



Left: Stewart's Sleeve Welded Joint. Above: The Dawson Joint.

age pockets) should be avoided, and gradients should be such that even flow can be maintained under all conditions without risk of oscillation or water hammer. Where pipes carry fluids at elevated temperatures, the question of expansion must be considered and, where possible, the main given sufficient inherent flexibility to obviate the use of special expansion "joints." These latter are always possible points of failure or, at any rate, of maintenance, and should be fitted only where there is no possibility of providing expansion bends.

In some processes working temperatures are high and permissible stresses correspondingly low, so that there must be available data on the strength of the materials to be used at these temperatures. Mild steel is suitable for all temperatures up to 900° F., but cast iron should not be used above 400° F., whilst brass and ordinary bronze should be eliminated for temperatures above 600° F. Special alloys are probably more extensively used in the chemical industry than in any other, but these special materials need be considered for pipework only where fluids of a corrosive nature are to be carried and where protective linings or coatings are inadmissible. If bolts or studs for the joints are subject to high temperatures (and they are usually subjected to high stress) it may be advisable to use a fairly high carbon steel containing about 1 per cent. each of chromium and molybdenum, but a minimum of nickel—not in any case exceeding 0.25 per cent. Careful heat-treatment is required and no further heat treatment should be given after the bolts or studs have been manufactured. Continuously threaded studs (or those with threads turned off between the nuts) are preferable to headed bolts having an abrupt change of section where failure is likely, this applying particularly to materials subject to age embrittlement.

The considerable development in the technique of welding in recent years has rendered possible the provision of "all-

attention to the design of such pipes, not only with a view to preventing leakage into or from the jacket, but to ensure that the flow of heating steam is evenly distributed throughout the main and that any water condensed in the jacket is efficiently drained off. In such mains, very careful attention must be given to the means provided for expansion.

Heat exchange apparatus is to be found in most plants in the chemical industry, such apparatus consisting essentially of a tubular system (carrying the heating or cooling medium) contained within the vessel holding the material to be treated. The tubular portions of heat exchangers are usually in the form of coils, either of the flat grid type or helical in form. These coils are mostly of mild steel tubing, galvanised where protection from corrosion is desired, and are made from individual lengths of tube joined by resistance welding so that the tube is really continuous; where coils are to be interconnected fusion welding is adopted in order to obviate joints, which may require periodical examination and renewal, and which may not be conveniently located. The manufacture of coils requires considerable skill, as the bends are usually of

short radii and flattening of the cross section or thinning on the outer radius must be kept at a minimum.

The specification for the insulation of pipework carrying fluids which must be maintained at fairly constant temperature ought to receive very careful attention, as defective and inefficient lagging is a source of considerable loss in the life of a plant. The manufacturers should be called upon to state and to guarantee the temperature drop in a pipe system under a given rate of flow; this figure can be easily checked whereas the rates of heat transfer usually quoted are not readily determined under working conditions. Where all-welded mains are provided, due to the absence of flanges, the lagging can be continuous, and apart from the appearance this avoids areas of possible loss, being particularly advantageous where the insulation must be impervious to water.

The importance of the pipework in modern plants is now fully recognised, and greater attention is being given to the design of each pipe system with a view to reducing to a minimum the financial losses which can occur in operation and maintenance.

Ultra-Violet Light as an Aid to Volumetric Work

By J. A. RADLEY, M.Sc., A.I.C.

WITH the introduction of a cheap and efficient source of ultra-violet light suitable for use in ordinary routine laboratory work, fluorescence analysis has made rapid advances. Unfortunately, in the first years of its use it captured the imagination of certain workers who, not knowing the pitfalls and peculiarities detected and overcome later, hailed it as an almost universal method which was indispensable to the analyst. The growth of the subject has been very rapid in the last few years. Up to the year 1916 there had been only about 40 references to it scattered throughout scientific literature. About this time Judd Lewis, using the spectrophotometer, put the subject on a quantitative basis, and his work was quickly followed by that of Bayle and Fabre in Paris, and by 1929 about 350 papers had appeared on the subject of fluorescence analysis.

Carrying Out the Titration

The property of many substances of fluorescing when irradiated with ultra-violet light is shown in the solid, liquid and vapour states, and also in solution. In the last case a number of factors influence the intensity and colour of the fluorescence, such as concentration, dielectric constant of solvent and especially important for our present purpose, the pH of the solution. To carry out the titration the usual apparatus may be employed, but the liquid to be titrated should be contained in a vessel of quartz or of Kavalier glass. The lamp should be allowed to run for five minutes, when its output of ultra-violet light becomes a steady maximum. As it is necessary to carry out the titration in the dark, the problem of reading the burette is a real one, more especially as the laboratory should be in darkness for several minutes to allow the eyes to become accustomed to the dark. When the liquid in the burette is sulphuric acid, a minute amount of quinine dusted on the surface will cause the meniscus to fluoresce brightly when stray ultra-violet light strikes it.

J. Grant has introduced a small float for use with other non-fluorescent liquids. It consists essentially of a piece of glass tubing, weighted at the lower end, its diameter being about two-thirds that of the burette, and containing a solution of quinine sulphate. Ultra-violet light striking on this causes the bright fluorescence of the quinine sulphate solution to illuminate the burette so that the graduations may be read in the dark to within 0.05 c.c. with ease. Turbid or darkly-coloured liquids, such as certain wines, vinegars, and fruit juices, are difficult to titrate, but if a suitable fluorescent

indicator be added, the titration may be readily carried out in ultra-violet light.

Umbelliferone and its derivatives, and quinine, were among the first indicators used, and at present a complete set of indicators is available, extending, continuously, over a very wide pH range. For acidimetric titrations, umbelliferone, acridine and *b*-naphthol can be safely used, the first mentioned and its derivatives being advantageously employed in the titration of strong acids and bases down to concentrations of 0.001 N. This indicator is inert up to pH 6.5, and above this value it shows a blue fluorescence. β -Methyl umbelliferone shows a similar behaviour, the change in fluorescence in this case occurring at pH 7.0. Umbelliferone and its derivatives may further be used for the titration of 0.01 N acetic acid of 0.01 N ammonia. The latter may also be titrated with acridine, the fluorescence colour of which changes from violet in alkaline to green in acid solution, the change occurring sharply at pH 4.8-5.0, the concentration of the ammonia may be as low as 0.002 N.

The Use of Quinine

Quinine which is a di-acid base was shown by Eisenbrand in 1929 to give two end points, the first change occurring sharply at pH 5.8 to 6.0 and the second at pH 9.5-10.0. Sulphuric, hydrochloric and oxalic acids can be successfully titrated with caustic soda solution, but poor results are obtained if ammonia is employed. For turbid solutions containing phosphoric acid, the method is particularly useful as quinine may be used for the titration of the first two stages of ionisation. An accurate end point may be obtained with a sulphuric acid-sodium hydroxide titration in solutions of 0.0001 N or even less strength.

Quinine in turbid or coloured solutions may readily be estimated as shown by Grant, making use of its fluorescence in sulphuric acid. The quinine is treated with a known amount of 0.01 N sulphuric acid, so that the latter is in excess. The excess is then back titrated with 0.01 N sodium hydroxide solution. The end point is reached when the excess acid over that required to form quinine sulphate is neutralised, and the further addition of alkali liberates quinine with an attendant marked decrease in the intensity of the fluorescence. With practice, an accuracy of at least 0.1 c.c. of 0.01 N alkali is readily attained, especially when control solutions adjusted to above and below the end point are used for comparison. In this case errors inherent in indicator

methods are absent as the substance being titrated acts as its own indicator. A further extension of the method is the detection of sulphites in foods, the sulphur dioxide being distilled into a trap containing hydrogen peroxide and quinine; a bright violet fluorescence being obtained in the presence of 0.25 mgm. or more of sulphur dioxide.

With coloured effluents, such as those from drug houses, umbelliferone is to be preferred to β -naphthol when the pH values are over 7.0. The effluents in this case are titrated in dilutions of 0.1 N to 0.01 N. With turbid solutions, such as those from paper factories, sewage works, etc., Grant has found it advantageous to add a foaming agent, in order that the solid particles may be carried from the body of the liquid into the foam, and thus allow the change of fluorescence to be more readily noted. The particular agent used by Grant for clearing the effluents from alkaline esparto grass digestion was saponin. A. G. Nasini and P. de Cori have found the method to be applicable to determinations on black liquor, wines, beers and acid solutions of ferrous sulphate.

J. Eisenbrand has used the intensity of fluorescence as a means of measuring ionisation constants of quinine sulphate, methoxyquinoline and β -naphthol and elaborated the formula

$$K = \frac{0.01 I (\text{OH})}{(1 - 0.01 I)}$$

K being the ionisation constant, or the hydroxyl ion concentration, and I the intensity of fluorescence, which has been corrected for light absorption and other disturbing factors, and the results obtained are in close agreement with those obtained by other methods. Other workers have used the

method for determining the ionisation constants of the flavins.

Red wines sometimes give high results when titrated with phenol phthalein, such as Catalonian and Alsatian wines. The addition of two or three drops of a 10^{-6} alcoholic solution of umbelliferone, followed by titration with 0.05 N sodium hydroxide solution, gives results which, although 0.5 c.c. to 1.0 c.c. less than phenol phthalein, are only 0.1 c.c. below those determined potentiometrically.

The intense fluorescence shown by uranium compounds is familiar to all chemists and attempts to use uranyl salts as indicators naturally followed, but they proved defective inasmuch that in the presence of certain ions they are deactivated. Chloride, bromide, cyanate and thiocyanate ions are among those showing this phenomena, and Y. Volmar found the amount of the suppressing ion required to destroy the fluorescence of a given amount of uranyl sulphate is inversely proportional to the chemical equivalent of the ion. The determination, therefore, of mineral halogens in the presence of organic halogen derivatives may be carried out as the latter class of compounds is without effect.

Enough has been said to show the scope of ultra-violet light as an aid in volumetric analysis; and in cases where it has been fully investigated it may be confidently stated that its advantages outweigh its disadvantages. The method may also be successfully applied with external indicators and with absorption indicators, and offers a valuable alternative to the usual methods for titrating coloured solutions such as dextrine solutions, vinegars and dyeworks effluents, or with turbid liquids such as effluents from tin plating factories.

Society of Public Analysts

Election of New Members

A JOINT meeting of the Society of Public Analysts with the Food Group of the Society of Chemical Industry was held at the Chemical Society's Rooms, Burlington House, on February 5, with the president of the Society of Public Analysts, Mr. John Evans, in the chair.

Certificates were read in favour of: Archie H. Cameron, Frederick T. W. Carman, Basil W. Clarke, Evelyn B. Daw, William E. J. Hansford, Cyril C. Harris, Arthur G. Jones, Reginald W. Money, Horace E. Newton, Kenneth Sams, Winifred E. Welton, and Donald M. Wilson. The following were elected members of the Society: George E. Boizot, Frank W. Bury, George H. Croft, George J. Cunningham, Reginald S. Garlick, Robert T. M. Haines, Philip J. C. Haywood, Douglas T. Lucke, Hugh C. Moir, Jack L. Pinder, Oswald V. Richards, Henry G. Smith, William Warren, and Kenneth Wallis.

Constitution of Tannings

Mr. Peter Maitland, B.Sc., Ph.D., gave an outline of the most recent views on the constitution of the various classes of tannins included in the groups of Freudenberg's classification into (i) hydrolysable tannins; (ii) condensed tannins; and (iii) unclassified tannins. The position of tea tannin in relation to this classification was also discussed.

In his "Survey of the Methods of Analysis for Tannins," Mr. C. Ainsworth Mitchell, D.Sc., F.I.C., described the principles and the drawbacks of the various methods of determining tannins. It was shown that precipitation with metallic compounds, with gelatin, or by the hide powder method is inaccurate, since gallic acid is simultaneously precipitated. Complete precipitation with alkaloids depends upon adequate adjustment of the pH value, and, subject to this, good results can be obtained gravimetrically by precipitation of the tannin as quinine tannate or cinchonine tannate, a different conver-

sion factor being required for each individual tannin. Mitchell's colorimetric method, in which the tinctogenic value of the substance is determined in terms of pyrogallol is very accurate for gallic acid, and the results can be calculated into the amount of tannin corresponding with gallic acid.

Experimental work on tea tannin was reported by Mr. M. Nierenstein, D.Sc., Ph.D., who described the preparation of a crystalline derivative which he had obtained from Assam tea by the action of a tannase, and discussed its constitution in relation to the problem of the nature of the tea tannins.

Dr. G. Roche Lynch, M.B., B.S., F.I.C., gave an outline of the physiological effects of caffeine upon the central nervous system and the muscular tissue, and upon the action of the kidneys. Fatal cases of caffeine poisoning, he said, were rare; there had been serious illness, but recovery after a dose of 4 grams. No post-mortem appearances that could be correlated with excessive drinking of tea or coffee had been reported.

Dealing with the tannins in tea, Mr. P. J. Norman, B.Sc., A.I.C., and Mr. E. B. Hughes, D.Sc., F.I.C., compared results obtained by the cinchonine, permanganate and hide powder methods, and it is shown that the first method is the most accurate. The amounts of tannin in teas of various origin were given, and the effects of varying the conditions of infusion were described.

Coffee Essences

In a paper on coffee essences, Mr. E. Hinks, B.Sc., F.I.C., pointed out that the amount of caffeine affords some indication of the proportion of coffee in commercial coffee extracts. Twelve coffee extracts contained from 0.1 to 0.33 per cent., 45 extracts from mixtures of coffee and chicory contained 0.05 to 0.38 per cent., and a sample of dry extract contained 6.8 per cent. of caffeine.

Recent Developments in Valve Practice

Diversity of Types and Materials

AT first sight it may seem remarkable that, even though pipes and most pipe fittings have been standardised so thoroughly, valves are made in perhaps a greater diversity of types and materials than any other single engineering product. This diversity, however, is not a matter of choice but of necessity, as manufacturers must meet the demand for valves suitable for all classes of duty in the various branches of industry. For the chemical industry alone it has been necessary to provide several special types of valves;



Fig. 1. Improved Lubricated 5 in. Cock, with compound gland.

in particular, valves which will resist the action of corrosive liquids and gases and which are suitable for controlling the flow of liquids carrying considerable quantities of sediment. Success has depended largely on extreme simplicity of design, the selection of materials of construction which are, as far as possible, non-corrodible under the operating conditions, and the adoption of easily renewable parts.

Cocks of non-metallic materials, such as porcelain or ebonite, have been largely employed in the chemical industry,

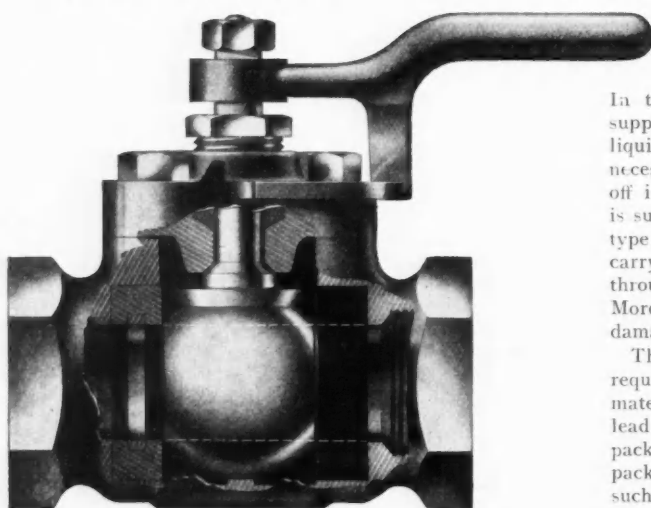


Fig. 2. Rubber seated full bore stop valve.

and their use is essential where certain acids are concerned. Such cocks, however, can be used only for very low working pressure and are unsuitable for insertion in a rigid pipe-line

of any considerable length owing to the risk of fracture. Further, if a plug becomes gummed up so that it will not turn, there is danger of breakage in endeavouring to free it. Metallic cocks or valves must therefore be employed if the working pressure is comparatively high, or if the pipe-line is subject to appreciable stress. The metal to be adopted depends, of course, on the nature of the liquid or gas. Lead, nickel, Monel metal, stainless steel, and even silver are sometimes employed, but grades of cast iron are now available which are resistant to a large number of corrosive media, and these, on account of their lowest cost, are employed wherever possible.

A difficulty sometimes encountered in the use of cocks is that corrosion of the bearing surfaces may cause the plug to stick, particularly if it is left in one position for a considerable time. The only method of preventing this is to ensure that the bearing surfaces of the plug are thoroughly lubricated by a film of insoluble grease. In Dewrance's improved lubricated cocks this is effected by greaseways through the plug leading to the bearing surfaces, grease being supplied to the underside of the plug by means of a screwpress mounted on the side of the cock shown in Fig. 1. Even if the plug sticks it can be freed by turning the screw-press, thus forcing grease at high pressure under the plug and easing it from its seating. These cocks are available up to 8 inch size, and special insoluble greases

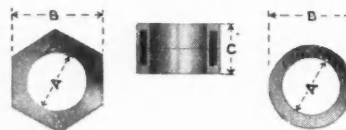


Fig. 3. Dewrance's Patent Packing Rings.

can be supplied to cover a wide range of fluids, chemicals, gases, etc.

While cocks have proved of great service in the chemical industry they suffer from the disadvantage that if serious corrosion has occurred it may take considerable time to recondition them. In order to avoid this difficulty, Dewrance and Co., Ltd., have recently placed on the market a rubber-seated full bore stop valve (Fig. 2).

In this valve the seatings, which are reversible, can be supplied in special quality rubber to resist the action of many liquids and gases, and they are easily renewed without the necessity of removing the valve from the pipe-line. The shut-off is pressure-aided and is absolutely tight, and the valve is suitable for working pressures up to 100 per sq. in. This type of valve is particularly well suited for use with liquids carrying sediment or grit, as the sediment is swept straight through and cannot interfere with the operation of the valve. Moreover, grit, even of an abrasive nature, will not readily damage the metal-on-rubber bearing surfaces.

The stuffing box of a valve used with corrosive liquids requires particular attention. The use of ordinary packing materials, such as asbestos or other fibrous substances, may lead to serious corrosion of the spindle and gland unless the packing is so treated as to be practically non-porous. Rubber packing rings are suitable for most chemical purposes, and such rings are generally employed for the full-bore valve illustrated. For higher temperatures, when a rubber ring would tend to become soft and adhere to the spindle, the best type of packing ring is one having a rubber core completely encased in a covering of homogeneous asbestos which has been heavily impregnated with graphite and highly compressed (Fig. 3). With this packing the resilience of a rubber

ring is largely retained, while the covering prevents the rubber being forced out under pressure and also greatly reduces friction. It must be remembered, of course, that many oils exert a solvent action on rubber, causing it to soften and swell, and though the compound type of packing is superior to the plain rubber ring it is preferable to employ packing rings of compressed granulated cork where non-corrosive oils are concerned.

Cocks and valves of the types described have the advantage of simple robust construction and are suitable for most applications in chemical engineering, but where very fine regulation of flow is required it may be necessary to employ valves of the screw-down type. Such valves, for chemical work, should always have externally-screwed spindles. When a non-rotating externally-screwed spindle is employed the stuffing box is sometimes replaced by a flexible diaphragm of non-corrodible material, but the lift of the valve must then be kept small to avoid straining the diaphragm unduly.

Valves of less conventional construction must be employed for special purposes, notably when dealing with liquids of such a corrosive nature that no ordinary metals can be allowed to come into contact with them. One special purpose valve for such conditions is a development, on the engineering scale, of the simple laboratory practice of flattening a rubber tube to stop the flow through it. Other constructions involve the use of rubber or ebonite moulded into position to protect the metallic parts. Such special constructions are often essential, but for most of the ordinary industrial and chemical liquids some metal is available which, at the worst, is only attacked very slightly, and where this is the case most users prefer a valve constructed entirely of that metal rather than one in which corrodible metal is protected by a non-metallic lining. At the same time, slight corrosion may cause considerable trouble in those types of cocks or valves which have un-lubricated metal-on-metal bearing surfaces, but with the types of construction illustrated good service may be expected even after a certain amount of corrosion has occurred.

The Conveyance of Corrosive Liquids

Chemical Stoneware in the Form of Pipes

THE conveyance of corrosive liquids presents a problem, as any breakdown of the piping system will hold up production whilst the fault is being rectified, and also constitutes a source of danger to workers; in addition there is the possibility of damage to plant or property in the vicinity of the pipe-line.

Plant engineers in many chemical and allied works make use of high-class chemical stoneware piping, giving them security in this part of their plant. It is important to note that chemical stoneware piping must not be confused with ordinary sanitary earthenware piping; the latter cannot be regarded as satisfactory for chemical processes. The term "stoneware" should be confined (but sometimes is not) to clay bodies so dense that they are watertight without the addition of a covering glaze, whilst bodies under the term "earthenware" require such a glaze to make them watertight. In all commercially-produced glazes there are blemishes or pinholes through which the liquid can penetrate to the body. If the body is porous, the liquid will eventually reach the outside of the clay body. It is easy to see, therefore, why "stoneware" and not "earthenware" is essential in the chemical industry where corrosive liquors have to be handled.

Chemical stoneware pipes are usually made in standard lengths of one metre or one yard, and there are three types of piping in general use. In spigot and socket piping the joints are made with an acid-proof silicate cement, or with a mastic poured in hot. An asbestos ring should be placed in the bottom of the socket to prevent the molten mastic running into the pipe, and the spigot end should not actually

touch the bottom of the socket; the joint is then flexible enough to take up heat expansion, which is very small.

Conical flanged piping (the second type) has joints which are designed for higher pressures than socket and spigot piping. The conical flanges are ground flat after firing, and are connected with rubber or asbestos washers between the ground faces and held together by metal collars bearing on the conical ends of the pipe. A soft asbestos or rubber packing strip should be used between the stoneware and the metal collar, and care should be taken to screw up the couplings evenly. Plain stoneware flanges drilled and bolted together are not suitable for stoneware pipes. Armoured stoneware piping (the third type) is suitable for high temperatures and pressures, and for all conditions where rough usage is likely to occur. Stoneware pipes armoured with cast iron jackets are used, jointed with rubber or asbestos rings and bolted together through the iron flanges.

At least one hanger or support should be provided for each length of pipe, preferably near the socket, and on long vertical pipe lines the superimposed weight should be carried by a bracket under the socket every 10 ft. or so.

The Chemical Society

Bangor Meeting : Ergot and Ergotism

ON account of the much greater cultivation of rye on poor soils in a dry climate on the Continent, its fungal parasite, ergot, has been of much greater importance there than in Britain, said Professor George Barger, in a lecture delivered under the auspices of the Chemical Society at Bangor, on February 7. Photographs of the earlier German references, beginning with a herbal of 1582, were shown; these accounts all mention its popular use in obstetrics, but the drug only received recognition by official medicine after its recommendation by American physicians (Stearns, 1808).

The most important therapeutic principle of the drug was only isolated in 1935 by Dudley and Moir, and found to be a relatively simple alkaloid ergometrine; it is, however, accompanied by larger quantities of more complex alkaloids (ergotinine, ergotoxine, ergotamine) which were doubtless responsible for the devastating outbreaks of gangrenous ergotism in the Middle Ages, affecting the poorest populations of many continental areas in times of famine. Professor Barger gave reasons for his suggestion that convulsive ergotism was due to an additional deficiency of vitamin A in the diet of German and Russian peasants, whilst France was more abundantly provided with dairy produce containing this vitamin. Slides relating to the former occurrence of gangrenous ergotism (St. Athony's fire, *ignis sacer*), to the German *Kriebelkrankheit*, and to modern sporadic cases of ergotism were shown. The symptoms were illustrated by an extract from a translation of *De Febribus* of Sennertus (of Agues and Fevers, London, 1658). The (very mild) Manchester epidemic of 1927-28 among poor immigrants eating rye bread was described and the chemical, pharmacological and pharmaceutical aspects of ergot were referred to.

IMPORTANT deposits of salt and potash have recently been discovered in Austria. It was formerly believed that the long-worked salt deposits at Hallein in the Province of Salzburg were merely embedded in rock and would eventually become exhausted. Recent drilling operations, however, have shown that there are further large salt deposits below those at present being worked. The newly discovered deposits consist of nearly pure rock salt, which when ground can be used for animals. This type of salt is being imported, mainly from Germany, or produced by denaturising pure salt. Of greater economic importance are the considerable beds of potash salts found by the drilling operations at the lower levels.

Personal Notes

MR. C. J. BLYTH, a former director of the Premier Oil and Cake Co., died at Hull on February 5.

MR. H. J. PATCHING has been appointed technical assistant to the Loughborough Gas and Electricity Departments.

MR. J. L. BIGGAR, chemical manufacturer of Paisley, left personal estate valued at £93,136.

MR. W. MCGAVIN, chemist, of Lancashire, left £1,000, with net personalty £734.

MR. A. MCBAIN, physiological chemist at the Scottish Plant Breeding Station, died on January 10.

LIEUT.-COL. J. H. M. GREENLY, deputy chairman of Babcock and Wilcox, Ltd., has joined the board of the Cape Asbestos Co., Ltd.

MR. L. GORDON, of Kent, controller of small arms ammunition during the late war, and prominently identified with the Ministry of Munitions, formerly works manager of Kynoch's, left £90,282, with net personalty £86,984.

DR. C. V. DRYSDALE, who is distinguished for his work in connection with electrical and optical instruments, has been awarded the thirteenth Duddell Medal by the council of the Physical Society. The medal is awarded to "persons who have contributed to the advancement of knowledge by the invention or design of scientific instruments, or by the discovery of materials used in their construction."

MR. J. VAN DEN BERGH, managing director of the Unilever concern, and MR. BICKER KAARTEN, managing director of the Lever soap factory at Batavia, have just returned from a journey through Sumatra, where they visited palm oil estates. Mr. Van Den Bergh declared that the visit to the Netherlands East Indies had been for the purpose of studying the possibility of expanding the soap industry.

THE HON. W. L. BAILLIEU died in London on February 6. He was one of Australia's leading industrialists and was largely responsible for the development of the mineral wealth of that country. He was chairman of the Electrolytic Zinc Co., of Amalgamated Zinc de Bavay's, of Hampden Cloncurry Copper Mines, and of the Zinc Producers' Association. He was also a director of the Copper Producers' Association, and of the Electrolytic Refining and Smelting Co.

Practical Grass Drying

First Commercial Evidence

AT the Oxford Mechanisation Conference on January 9, Mr. C. Higgs, Stratford-on-Avon, read a paper on grass drying. Mr. Higgs said that in August, 1934, he installed a small grass drier and in the spring of 1935 began a full programme of drying. Between April and June, 150 tons of dried grass was made with a total crude protein content of from 13 to 18 per cent. June was a wet month, but drying was continued without interruption in weather quite impossible for hay-making. Between September 25 and November 7 a further fifty tons of dried grass was produced, this time with a protein content of over 16 per cent.

Throughout the spring drying period the drier was run continuously day and night, the men worked three shifts of 8½ hours each, the overlapping half hour was used for clinkering, cleaning up preparing banding for bales and other odd jobs. As they learned the job the hands preferred to work two shifts of twelve hours and to draw extra pay. The cost of drying the grass was not only economical but actually cheap. The costs of production, based on coke at 27s. per ton, labour 8d. an hour, and electricity ½d. a unit, were: Coke 16s., man labour 13s., electricity 5s. 8d., banding 1s. 6d., and repairs and sundries 1s. 6d.; a total of £1 17s. 8d. per ton of grass dried.

Continental Chemical Notes

Finland

CARBON DIOXIDE IS NOW BEING MADE in Finland by two concerns, the Finska Kolsyreindustri A.B., of Helsingfors, and Gronberg and Co., of Dickursby.

Greece

ENCOURAGING RESULTS ARE REPORTED to have followed an oil drilling expedition in Western Thrace in the coastal region, and hopes are entertained of rendering Greece independent of imported petroleum.

Switzerland

RECENT COMPANY FORMATIONS include: S.A. de Produits pour la Photographie Tellko in Freiburg with a capital of 600,000 francs (manufacture of photographic papers and films); Electrona A.G. in Solothurn with a capital of 100,000 francs (chemical and electrotechnical products).

France

AN IMPORTANT CASEIN MANUFACTURING CONCERN in Charente is reported to be negotiating for the production of artificial wool by the recently disclosed Italian process. It is understood that the shortage of casein is preventing full development of the process in Italy.

PURE NEUTRAL AND SULPHUR-FREE OLIVE OIL has been examined for its possibilities as a lubricant. According to recent investigations ("Industrie Chimique," January), satisfactory results have been obtained with a mixture of 25 per cent. specially refined olive oil and 75 per cent. mineral oil.

Russia

ETHYLENE IN A VERY HIGH DEGREE OF PURITY is now prepared from natural gas by a low temperature process, according to a report in "Sa Industrialisaziju."

AN EXTENSION IN RUSSIAN WHALING ACTIVITIES is revealed by the impending despatch to the Antarctic of seven fully equipped ships. Hitherto the Far Eastern Arctic region has been the sole sphere of activity of Russian whalers.

THE COMPLETE DEHYDRATION OF MAGNESIUM CHLORIDE by a new Russian process is reported in "Industrie Chimique" (Paris). After partial dehydration to the dihydrate by gradual heating up to a temperature of 120° C., the powdered material is suspended in liquid ammonia when the water of crystallisation is displaced by ammonia. The resulting magnesium chloride—ammonia double compound is decomposed by heating to 290 to 320° C., leaving a residue of the perfectly anhydrous chloride.

Far Eastern Chemical Notes

Japan

THE JAPANESE SEA WATER INDUSTRIAL CO. (Nippon Kaisui Kogyo K.K.) has been formed in Osaka with a capital of 500,000 yen for the purpose of extracting compounds of magnesium and potassium, bromine and other chemicals from sea water.

THE JAPANESE ELECTROINDUSTRY CO. (Nippon Denki Kogyo K.K.) has produced 99.98 per cent. nickel on a small scale at its aluminium factory in Yokohama, utilising ores from the Hyogo prefecture. When the process is developed on a large scale the company hopes to sell nickel at a price considerably below the current Canadian price.

Manchuria

REVIEWING THE MANUFACTURING ACTIVITIES of the South Manchurian Railway Co., "Chemische Industrie" (February 8) reports that approval has been given to the construction of three new plants for the production of aluminium, soda and liquid fuel from coal respectively. Fushun has been selected as the centre for the coal liquefaction plant, the cost of which is estimated at 15 to 16 million yen. In all, the new enterprises will call for a capital outlay of 70 million yen.

Chemical and Allied Stocks and Shares

A good volume of business has again been reported in most sections of the Stock Exchange this week. Imperial Chemical were higher, in continued anticipation that the dividend will be maintained at 8 per cent. Salt Union found numerous buyers in response to anticipations that either a larger dividend or a share bonus is possible. B. Laporte attracted more attention now they are "ex rights" to the recently-announced share bonus. William Blythe 3s. ordinary shares attracted increased attention and at the time of writing have moved up from 7s. 6d. to 8s. 1½d., partly on the anticipation of the raising of the dividend to 10 per cent. or more and partly on vague reports of possible important developments impending. Boots Pure Drug were active, there being continued talk of a possible bonus, or perhaps an offer of additional shares to shareholders on favourable terms to provide for the further expansion of the business. Fison, Packard and Prentice were very firm, as were Cooper, McDougall and Robertson, the last named on the hopes of a larger dividend. Distillers have moved up sharply; in addition to anticipations of a larger dividend there is also talk in the market that a bonus is possible. Reckitt and Sons ordinary continued more active. Paint shares also tended to receive more attention. Lewis Berger were bought on the possibility of a larger interim dividend and Pinchin, Johnson on the view that the total dividend for the year may be raised from 17½ per cent. to 20 per cent. British Cyanides received a good deal of attention and remained very steady around 3s. 10½d. British Drug Houses were also in larger request with business marked up to 21s. 3d. Borax Consolidated responded readily to the

raising of the dividend to 5 per cent., while there was better demand reported for the company's other classes of shares and the debentures in view of the apparently very satisfactory yields offered. Goodlass Wall have moved up further on a more general belief that the dividend may be raised to 7½ per cent. Unilever moved up as a result of talk of a possible increase in the final dividend, although there are many factors to be considered in estimating the prospects of a company with a world-wide business, and the dividend estimates are largely a matter of guesswork. There has been a sharp marking up of Lawes' Chemical to 8s. 9d. United Molasses continued rather less in evidence, despite the continued hopes that an interim dividend may be announced next month. International Nickel were again active. Consett Iron shares came in for increased business at higher prices, largely as a result of the increase in the price of N.E. Hematite iron from 71s. to 74s. per ton. The company cannot resume dividends on its ordinary shares until the accumulated arrears of preference dividend are dealt with, but the market is looking for a scheme to deal with this and to permit of regular dividends in the future. The preference shares of Bradford Dyers and Bleachers were in better request. Cellulose Acetate were more active on the hope that they will enter the dividend list this year, but Courtaulds were rather dull earlier in the week on uncertainty whether the forthcoming announcement would bear out hopes of a larger dividend. Oil shares reacted on a statement attributed to Sir Henri Deterding that lower oil prices are likely, but this statement was later denied and share prices subsequently showed partial recovery.

Name.	Feb. 11.	Feb. 4.
Anglo-Iranian Oil Co., Ltd. Ord.	90/-	92/6
" 8% Cum. Pref.	35/9	36/9
" 9% Cum. Pref.	36/9	37/9
Associated Dyers and Cleaners, Ltd. Ord.	1/10½	1/10½
" 6½% Cum. Pref.	6/3	5/6½
Associated Portland Cement Manufacturers, Ltd. Ord.	73/-	72/6
" 5½% Cum. Pref.	28/-	28/-
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	2/6	2/6
Berger (Lewis) & Sons, Ltd. Ord.	66/10½	66/10½
Bleachers' Association, Ltd. Ord.	7/6	7/6
" 5½% Cum. Pref.	13/1½	12/6
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	20/-	20/-
Boots Pure Drug Co., Ltd. Ord. (5/-)	57/-	55/6
Borax Consolidated, Ltd., Pfd. Ord. (£) ...	112/6	110/-
" Defd. Ord.	23/1½	22/6
" 5½% Cum. Pref. (£100)	£11/15/-	£11/15/-
" 4½% Deb. (1st Mort.) Red. (£100)	£107/10/-	£107
" 4½% 2nd Mort. Deb. Red. (£100)	£105/10/-	£104/10/-
Bradford Dyers' Association, Ltd. Ord. ...	9/4½	9/4½
" 5% Cum. Pref.	13/9	13/9
" 4% 1st Mort. Perp. Deb. (£100)	£87/10/-	£87/10/-
British Celanese, Ltd. 7% 1st Cum. Pfd.	25/-	25/3
" 7½% Part. 2nd Cum. Pref.	22/9	23/-
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	6/3	6/3
" 4% 1st Mort. Deb. Red. (£100)	£96	£96
British Cyanide Co., Ltd. Ord. (2/-)	3/9	3/10½
British Drug Houses, Ltd. Ord.	18/1½	18/1½
" 5% Cum. Pref.	21/10½	21/10½
British Glues and Chemicals, Ltd. Ord. (4/-)	8/1½	8/1½
" 8% Pref. (Cum. and Part.) ...	28/9	28/9
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	48/9	48/9
" 5½% Cum. Pref.	25/7½	25/7½
" 4½% First Mort. Deb. Red. (£100)	£107/10/-	£107/10/-
British Oxygen Co., Ltd. Ord.	122/6	123/9
" 6½% Cum. Pref.	32/6	32/6
British Portland Cement Manufacturers, Ltd. Ord.	92/6	87/6
" 6% Cum. Pref.	30/-	30/6
Bryant & May, Ltd. Pref.	66/3	66/3
Burt, Boulton & Haywood, Ltd. Ord.	20/-	20/-
" 7% Cum. Pref.	27/6	27/6
" 6% 1st Mort. Deb. Red. (£100)	£102/10/-	£102/10/-
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	112/6	112/6
" 4% 1st Mort. Deb. Red. (£100)	£96/10/-	£96/10/-
Calico Printers' Association, Ltd. Ord. ...	9/4½	9/4½
" 5% Pref. (Cum.)	15/-	16/3
Cellulose, Acetate Silk Co., Ltd. Ord.	14/8½	14/8½
" Deferred (1/-)	3/1½	2/10½

Name.	Feb. 11.	Feb. 4.
Consett Iron Co., Ltd. Ord.	13/6	11/6
" 8% Pref.	32/6	31/3
" 6% First Deb. stock, Red. (£100)	£109/10/-	£108/10/-
Cooper, McDougall & Robertson, Ltd. Ord.	38/9	38/9
" 7% Cum. Pref.	30/-	30/-
Courtaulds, Ltd. Ord.	58/1½	59/4½
" 5% Cum.	26/3	26/3
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre-Pref.	25/-	25/-
" Cum. 6% Pref.	28/9	28/9
" 6½% Cum. Pref.	31/10½	31/10½
" 7½% "A" Cum. Pref.	32/6	30/-
Distillers Co., Ltd. Ord.	102/6	99/6
" 6% Pref. Stock Cum.	32/-	31/9
Dorman Long & Co., Ltd. Ord.	226/3	20/9
" Pref. Ord.	36/3	32/6
" 6½% Non-Cum. 1st Pref.	23/6	23/3
" 8% Non-Cum. 2nd Pref.	25/-	24/-
" 4% First Mort. Perp. Deb. (£100)	£103/10/-	£103/10/-
" 5% 1st Mort. Red. Deb. (£100)	£106/10/-	£105/10/-
English Velvet & Cord Dyers' Association Ltd. Ord.	4/4½	4/4½
" 5% Cum. Pref.	7/6	8/9
" 4% First Mort. Deb. Red. (£100)	£72/10/-	£72/10/-
Fison, Packard & Prentice, Ltd. Ord.	46/3	46/3
" 7% Non-Cum. Pref.	31/3	31/3
" 4½% Debs. (Reg.) Red. (£100)	£106	£106
Gas Light & Coke Co., Ltd.	28/-	27/9
" 3½% Maximum Stock (£100) ...	£89/10/-	£89/10/-
" 4% Consolidated Pref. Stock (£100)	£108/10/-	£108/10/-
" 3% Consolidated Deb. Stock, Irred. (£100)	£92/10/-	£91/10/-
" 5% Deb. Stock Red. (£100) ...	£118/10/-	£118/10/-
" 4½% Red. Deb. Stock (1960-65) (£100)	£115/10/-	£115/10/-
Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	15/7½	15/-
" 7% Prefd. Ord. (10/-)	13/9	13/9
" 7% Cum. Pref.	30/-	30/-
Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref.	24/4½	24/4½
" 6½% Cum. Pref.	28/9	28/9
Imperial Chemical Industries, Ltd. Ord. ...	38/-	37/6
" Deferred (10/-)	9/-	9/-
" 7% Cum. Pref.	34/-	34/-
Imperial Smelting Corporation, Ltd. Ord.	15/6	15/6
" 6½% Pref. (Cum.)	25/7½	25/7½
International Nickel Co. of Canada, Ltd. Cum.	\$49½	\$48¾
Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	105/-	105/-
" 4% Mort. Deb. Red. (£100)	£98/10/-	£98/10/-
Laporte, B., Ltd. Ord.	112/6	130/-

Name.	Feb. 11.	Feb. 4.	Name.	Feb. 11.	Feb. 4.
Laves Chemical Co., Ltd. Ord. (1/-)	8/9	6/3	Salt Union, Ltd. Ord.	50/-	47/6
" 7% Non-Cum. Part Pref. (10/-)	10/-	10/-	" Pref.	47/6	47/6
Lever Bros., Ltd. 7% Cum. Pref.	33/-	33/-	" 4½% Deb. (£100)	£107/10/-	£107/10/-
" 8% Cum. "A" Pref.	33/6	33/9	South Metropolitan Gas Co. Ord. (£100) ...	£132/10/-	£132/10/-
" 20% Cum. Prefd. Ord.	80/-	80/-	" 6% Irred. Pref. (£100)	£149/10/-	£149/10/-
" 5% Cons. Deb. (£100)	£108/10/-	£108/10/-	" 4% Pref. (Irred.) (£100)	£105	£105
" 4% Cons. Deb. (£100)	£106/10/-	£106/10/-	" Perpetual 3% Deb. (£100)	£89/10/-	£89/10/-
Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3	" 5% Red. Deb. 1950-60 (£100)	£114/10/-	£114/10/-
" 6% 2nd Pref. (5/-)	6d.	6d.	Staveley Coal and Iron Co., Ltd. Ord. ...	53/9	53/9
" 6% 1st Debs. (Reg.)	442	440	Stevenson & Howell, Ltd. 6½% Cum. Pref. ...	26/3	26/3
Major & Co., Ltd. Ord. (5/-)	7½d.	7½d.	Triplex Safety Glass Co., Ltd. Ord. (10/-) ..	89/4½	90/7½
" 8% Part. Prefd. Ord. (10/-) ...	9d.	9d.	Unilever, Ltd. Ord.	35/-	33/9
" 7½% Cum. Pref.	1/6½	1/6½	" 7% Cum. Pref.	31/9	31/9
Pinchin, Johnson & Co., Ltd. Ord. (10/-) ..	45/-	45/-	United Glass Bottle Manufacturers, Ltd. Ord.	42/6	42/6
" 1st Pref. 6½% Cum.	32/-	32/-	" 7½% Cum. Pref.	32/6	32/6
Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) 7% Gld. Ln. Sr. "A" and "B" Rd.	£78	£78	United Molasses Co., Ltd. Ord. (6/8)	26/3	26/3
Reckitt & Sons, Ltd. Ord.	118/9	118/9	" 6% Cum. Pref.	26/3	26/3
" 4½% Cum. 1st Pref.	24/4½	24/4½	United Premier Oil & Cake Co., Ltd. Ord. (5/-)	11/9	10/6
			" 7% Cum. Pref.	25/7½	25/-
			" 4½% Deb. Red. (£100)	£104	£101/10/-

Inventions in the Chemical Industry

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Open to Public Inspection

DISULPHIDES FROM MERCAPTOHIAZOLES, production.—Silesia Verein Chemischer Fabriken, Ida und Marienhütte. Aug. 3, 1934. 6401/35.

CONSTITUENTS OF GASEOUS MIXTURES, method of separating.—Air Reduction Co., Inc. Aug. 1, 1934. 14487/35.

PIGMENTED PAPER, method of making.—American Zinc, Lead and Smelting Co. July 31, 1934. 16566/35.

WOOD PRESERVATIVES.—Grubenholzimprägnierung Ges. Aug. 3, 1934. 19291/35.

VALUABLE PRODUCTS from solid carbonaceous materials by destructive hydrogenation, process for production.—International Hydrogenation Patents Co., Ltd. July 31, 1934. 23247/35.

LIGHT STABILISATION OF VINYL POLYMERS.—Carbide and Carbon Chemicals Corporation. July 31, 1934. 20451/35.

FERMENTATION of beet molasses.—Commercial Solvents Corporation. July 30, 1934. 20891/35.

Specifications Accepted with Date of Application

DRYING OILS.—Imperial Chemical Industries, Ltd., E. W. Fawcett and E. E. Walker. Nov. 24, 1933. 442,000.

ANTHRAQUINONE DYESTUFFS and process for their manufacture.—Chemical Works, formerly Sandoz. Aug. 17, 1933. 441,845.

WATER-INSOLUBLE AZO DYESTUFFS, manufacture.—A. Carpmæl (I. G. Farbenindustrie). July 23, 1934. 441,855.

STABLE HIGHLY CONCENTRATED PREPARATIONS containing alkali hydrosulphides, manufacture.—A. Carpmæl (I. G. Farbenindustrie). July 23, 1934. 441,856.

DYEING FELTS, process.—I. G. Farbenindustrie. Dec. 7, 1933. 441,871.

CELLULOSE MASSES, methods of producing.—British Thomson-Houston Co., Ltd. July 26, 1933. 442,012.

WETTING, WASHING, DISPERSING, AND LIKE AGENTS, manufacture and production.—Coutts and Co. and F. Johnson (legal representatives of J. Y. Johnson (deceased)) (I. G. Farbenindustrie). July 27, 1934. 441,878.

Applications for Patents

(January 30 to February 5 inclusive.)

GASEOUS OLEFINS, polymerisation.—Anglo-Iranian Oil Co., Ltd., and A. E. Dunstan. 3504, 3505.

NITRILES, process of preparing.—Armour and Co. (United States, March 6, '35.) 2960.

STEREoisomeric ALCOHOLS of androstane series, process for separating.—A. G. Bloxam (Soc. of Chemical Industry in Basle). 3487.

THIAZOLIUM COMPOUNDS, manufacture.—I. G. Farbenindustrie. 2873.

ANTHRAQUINONE DERIVATIVES, manufacture.—Coutts and Co. (I. G. Farbenindustrie). (Aug. 3, '35.) 3550, 3551.

ORGANIC CONDENSATION PRODUCTS, manufacture, etc.—Deutsche Hydrierwerke A.-G. (Jan. 16, '35.) (Germany, Jan. 16, '34.) 3542.

DYESTUFFS OF ANTHRAQUINONE SERIES, manufacture.—E. I. du Pont de Nemours and Co. and F. W. Johnson. 3540.

OLEFINS, polymerisation.—R. O. Gibson, M. W. Perrin and Imperial Chemical Industries, Ltd. 3372.

DIALKYL SUBSTITUTED AMIDES OF ISOXAZOLE CARBOXYLIC ACIDS, manufacture.—F. Hoffmann-La Roche and Co., A.-G. (Germany, Feb. 22, '35.) 3093.

HYDROCARBONS, ETC., CONTAINING OXYGEN from carbon monoxide and hydrogen, production.—G. W. Johnson (I. G. Farbenindustrie). 3523.

Prices of Chemical Products

WITH the exception of the products mentioned below the prices of British chemicals remain as reported in THE CHEMICAL AGE of February 8 (pages 128-129). The prices quoted cover fair quantities net and naked at sellers' works unless otherwise stated.

LONDON.—Prices still continue steady with a fair demand for all chemicals.

MANCHESTER.—Fairly satisfactory conditions have been reported this week on the Manchester chemical market so far as the general movement into consumption is concerned. Textile chemicals for the bleaching, dyeing and finishing trades in Lancashire are being called for against contracts on a scale which represents some slight measure of improvement compared with the experience a short time ago, and general chemicals, also, are being taken up in regular quantities. Fresh bookings this week, however, have continued only on moderate lines, the bulk of the new business concerning small parcels for near delivery positions. Only slight changes in prices have occurred, most classes of chemicals being maintained on a firm basis. The tendency in a few sections of the by-products market, however, is easy, and lower values are being indicated in respect of crude tar, pitch and one or two other lines.

SCOTLAND.—There has been a steady trade in general chemicals for home trade during the week, but export inquiries have again been rather limited. Prices generally continue very steady at about previous figures with no changes of importance to report.

General Chemicals

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £48 10s. to £54 ex store.

CADMIUM SULPHIDE.—5s. 3d. to 5s. 6d. per lb.

CHROMETAN.—Crystals, 2½d. per lb.; liquor, £19 10s. per ton d/d. LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: 441.

LITHOPONE.—30%, £16 to £16 10s. per ton.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99½/100%, powder, £37. MANCHESTER: £39.

POTASSIUM PRUSSIAN.—LONDON: Yellow, 8½d. to 8½d. per lb. SCOTLAND: Yellow spot, 8½d. ex store. MANCHESTER: Yellow, 8½d.

SODIUM ACETATE.—LONDON: £21 per ton. SCOTLAND: £20 15s.

SODIUM CHLORATE.—£30 per ton. SCOTLAND: 3½d. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 6½d. to 7½d. per lb.; crude, 60's, 1s. 11½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7½d. per lb.; crude, 2s. 2d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

CRESOTE.—B.S.I. Specification standard, 5½d. per gal. f.o.r. Home, 3½d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 4½d. to 5½d. SCOTLAND: Specification oils, 4d.; washed oil, 4½d. to 4½d.; light, 4½d.; heavy, 4½d. to 4½d.

PITCH.—Medium, soft, 43s. to 45s. per ton, in bulk at makers' works. MANCHESTER: 42s. 6d. f.o.b., East Coast.

From Week to Week

BENN BROTHERS, LTD., proprietors of *THE CHEMICAL AGE*, are showing at the British Industries Fair at Stand 425 at the White City (London) section and at Stand A.625 at Birmingham.

NEMLIN CHEMICALS, LTD., Nemlin Distillery, Bradley Fold, near Bolton, have increased their nominal capital by the addition of £7,500, beyond the registered capital of £2,500. The additional capital is divided into 7,500 5 per cent. cumulative preference shares of £1 each.

A FIRE BROKE OUT late on February 10 in the plaster-board plant of the Imperial Chemical Industries works at Billingham. The plant is confined to the manufacture of a special composite material used for building purposes. Billingham Fire Brigade was called but, because of the smouldering nature of the material, they were unable to discover the seat of the outbreak.

CORNWALL COUNTY COUNCIL invites tenders for supplies during the year ending March 31, 1937, of refined tar, tar compounds, bitumen and cold emulsions, tools, explosives, beltings, paint, concrete kerbs and pipes, earthenware pipes, paving slabs, bricks and cement, etc. Tenders on forms provided have to reach the clerk, Mr. T. A. H. Sheers, at the County Hall, Truro, not later than February 19.

THE MORGAN CRUCIBLE CO., manufacturers of pottery and refractory ware, and accessories for the electrical trade, has acquired a controlling interest in the Ship Carbon Co. of Great Britain, a £500,000 public company registered in August, 1934. The issued capital of the Morgan Crucible Co. is £4,237,000, of which £1,000,000 is in 5½ per cent. cumulative preference stock, £1,079,000 in 5 per cent. cumulative preference stock, £2,000,000 in ordinary stock and £158,000 in "B" stock.

OFFICIAL DEALINGS began on the local Stock Exchange at Johannesburg, on February 12, for South Africa's latest base metal company, Associated Manganese Mines of South Africa, Ltd., which is under the aegis of Anglo-Transvaal Consolidated Investment Co., Ltd. Unofficial dealings have taken place at 13s. for the 5s. shares, a large percentage being on London and Continental account. It is expected that Associated Manganese will come on the London market at an early date.

A NEW OBJECTS CLAUSE is proposed by the British Oxygen Co. in its memorandum of association to cover additional activities not included in the original clause. In a circular to the shareholders, the directors refer to the proposal to distribute a capital bonus of two ordinary shares for every £7 ordinary stock held. After full consideration, and having regard to the strong financial position of the company and to the fact that there is standing to the credit of the general reserve account a sum of £1,040,465, the directors consider that they are justified in recommending the capitalisation of £552,372, part of this sum.

THROUGHOUT CORNISH MINING CIRCLES, particularly the Camborne and Redruth area, the information that the famous Dolcoath Mine had been taken over by the South Crofty Mining Co. has given profound satisfaction. In former days Dolcoath was practically the hub of activity and for a long period continued to provide various ores of great value, also considerable employment as well as an immense financial benefit to the whole district. Falling on evil times operations were suspended and in the spring of 1930 a receiver was appointed. The development of Dolcoath will naturally proceed very slowly, but the enterprise is expected to bring back a measure of prosperity.

TWO FURNACES, idle for six years, have been brought into service to produce high-grade acid steel at Clyde Bridge Steelworks, Cambuslang. A third furnace is being prepared for operation. The furnaces are on the old side of the works, taken over from the original Clyde Bridge Company by Colvilles during the war. Colvilles built a new melting shop and rolling mills. The older portion of the works became idle after the collapse of the post-war demand. It was operated for a few months during the last active period, about 1929. The decision to recondition old furnaces indicates the strong position of iron and steel markets.

PROPOSALS FOR NEW LABORATORIES at Barrow Hill, Regent's Park, are being considered by the Metropolitan Water Board. They are estimated to cost £69,816. The present laboratories at Nottingham Place, W., are considered to be inadequate and new accommodation to be impracticable. In the opinion of the architect the position selected at Barrow Hill reservoir provides an unusually good site for a building of public significance, which would be clearly visible from a large part of London. At the present laboratories, according to a report presented to the Board, "there is not sufficient provision for the protection of the staff from heat and fumes; vacuum, compressed air, and live steam services are non-existent. The inclusion in the new design of separate sterilising, distillation, fume, still and cold rooms, the introduction of the modern services mentioned, the remedying of various other deficiencies, and the provision of suitable rooms for the recently appointed biological and research assistants are all important and material factors to account for the increased accommodation necessary."

PLYMOUTH CITY COUNCIL invites tenders for supplies to the various departments, hospitals, institutions, sanatoria, etc., under the control of the Corporation of cement, oils and petrol, disinfectants, etc. Tenders on forms provided have to be delivered to the Town Clerk, Mr. Colin Campbell, before noon on February 26.

A TABULAR STATEMENT circulated by the President of the Board of Trade in answer to a question showed that the total monthly exports to Italy from the United States of crude petroleum and petroleum products had risen from 75,674 barrels of 35 imperial gallons in December, 1934, to 596,772 in November, 1935. The total for the twelve months ended in that month was 2,561,312.

DORMAN LONG AND CO., Middlesbrough, announce that they will bring into operation within the next two months three additional blast furnaces at their Cleveland works, thus raising the total number of active furnaces at the works to 16. Further, two newly reconstructed blast furnaces—one at Redcar and one at the Acklam works—will be "blown in" to take the place of two due for repairs. Including ancillary services, this will mean employment for an additional 200 workers.

A REPRESENTATION HAS BEEN MADE to the Board of Trade under Section 10(5) of the Finance Act, 1926, for the exemption from Key Industry Duty of optical colorimeters such as comprise a prismatic eyepiece and two vertical tubes, one with draw-off cock or, alternatively, rack and pinion device, to vary the depth of liquid viewed, and the other carrying standard colour discs. Any communication should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, S.W.1, not later than March 7.

THE SCAPA DISTILLERY, Kirkwall, owned by the Scapa Distillery, Ltd., has been sold as a going concern to Bloch Bros., Scotch whisky distillers and exporters, Glasgow. The distillery was opened in 1885 by McFarlane and Townsend, Glasgow, and was subsequently operated by J. T. Townsend, and Co., Glasgow. In 1919 it was acquired by a private company for £15,000. No whisky has been produced in the distillery since 1931, but the new owners are to resume distilling almost immediately. Mr. Angus Fraser, who went to Orkney about 30 years ago, having been associated with the Scapa Distillery during the whole period, is to continue as manager.

THE CLAIM THAT GERMANY can eventually cover her requirements of petroleum from home production was made last week by Professor Steinbrecher in a lecture before the German Association for oil investigation. He admitted, however, that she produced barely 35 per cent. of the total consumption at present. In pursuance of the mobilisation of industry for war purposes, Germany is straining every nerve to render herself independent of imports of oil from abroad. The application of Sanctions against Italy has led indirectly to these efforts being speeded up. The professor recommended the greatest economy in the use of machine oil in factories and other businesses. Even oil leakages from cars, he said, were not to be neglected. He described how methane (the basis of fire damp), wood gas and coal dust were being used to an increasing extent as fuel to save oil for military purposes and reduce the expenditure of foreign exchange for purchases abroad.

A COMPREHENSIVE INSIGHT into the municipal administration of a large city is contained in the latest edition of the City of Birmingham Handbook, just published by the City's Information Bureau. The interest of the modern municipality in its citizens extends from the cradle to the grave; from the provision of dustbins to the encouragement of an appreciation of good music by the establishment of a rate-aided orchestra. An interesting story has been made of the complex business of efficiently managing a city with a population of well over a million. Successive sections, well illustrated and extending over 320 pages, tell of Birmingham's progress. The publication does much to explain the mystery of how the ratepayers' money is spent, and should be of interest to a far wider public than merely that of Birmingham. Copies may be obtained from the Birmingham Information Bureau, The Council House, Birmingham 1.

THE ADVERTISING ASSOCIATION is adopting a novel course in connection with its tenth annual conference. Hitherto it has held a conference in some important centre at home; this year it has been decided to hold the conference afloat. Four hundred members will leave England on July 4, and visit Copenhagen, Stockholm, Helsingfors and Oslo. Arrangements are being made in all those cities to receive and entertain this highly representative party of British publicity experts, and the scheme should have a marked effect upon Anglo-Scandinavian trade. The countries to be visited, Denmark, Norway, Sweden and Finland, constitute with us the sterling block. The Advertising Association is, therefore, well advised to direct its efforts to territory where trade restrictions and currency complications have been reduced to the minimum. Sir Ernest Benn, president of the Association, will lead the party and preside at the conferences which will be held afloat. Further particulars of this delightful business and pleasure cruise can be obtained from Mr. Russell Chapman, general secretary, the Advertising Association, 110-111 Fleet Street, London, E.C.4.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt as specified in the last available Annual Summary, is also given marked with an *—followed by the date of the Summary, but such total may have been reduced.)

H. D. POCHIN AND CO., LTD., St. Austell, manufacturing chemists, etc. (M., 15/2/36.) Registered January 31, series of £20,000 (not exceeding) debentures, present issue £18,000; gen. charge. *£10,250. July 25, 1935.

T. LUCAS AND CO., LTD., Bristol, chemical manufacturers. (M., 15/2/36.) Registered January 30, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on Ruskit Mills, Moravain Road, Kingswood (Glos.). *—, October 14, 1934.

Satisfactions

BAIRD AND TATLOCK (LONDON), LTD., laboratory furnishers, etc. (M.S., 15/2/36.) Satisfaction registered February 5, of debentures registered May 24, 1932, to extent of £1,000.

MID-CORNWALL CHINA CLAY CO., LTD., St. Austell. (M.S., 15/2/36.) Satisfaction registered January 31, of debentures registered October 4, 1920.

County Court Judgments

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

INSECTICIDES AND CHEMICALS, LTD., 92 Baker Street, W. (C.C., 15/2/36.) £34 12s. 6d. December 18.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

South Africa.—H.M. Trade Commissioner at Johannesburg reports that the City Council of Johannesburg is calling for tenders, to be presented in Johannesburg by February 22, 1936, for the supply of sluice valves, etc. (Ref. T.Y./5684.)

Argentina.—A firm established in Buenos Aires wishes to obtain the representation of United Kingdom manufacturers of medicinal products and drugs. (Ref. No. 120.)

Argentina.—The Commercial Counsellor to H.M. Embassy at Buenos Aires reports that the Argentine State Oilfields Directorate is calling for tenders, to be presented in Buenos Aires by March 10, 1936, for the supply and delivery of various kinds of packing (asbestos, hemp, rubber and leather, etc.) and 1,500 rubber rings for pump rod packings. (Ref. T.Y. 5683.)

Argentina.—The Commercial Counsellor to H.M. Embassy at Buenos Aires reports that the Argentine State Oilfields Directorate is calling for tenders, to be presented in Buenos Aires by March 11, 1936, for the supply of a motor pumping set. (Ref. T.Y. 5696.)

Company News

Reckitt and Sons.—A quarterly dividend and interest on $\frac{4}{5}$ per cent. and 5 per cent. preference shares and 4 per cent. debenture stock is announced, payable on April 1, 1936, to all holders registered on March 7, 1936.

A. Boake Roberts and Co.—A third interim dividend of 2 per cent., net is announced on the ordinary shares (against 1 per cent.), making 5 per cent. net to date.

British Oil and Cake Mills.—The payment of 6 per cent., less tax, is to be made on the ordinary stock, making 10 per cent. (against 6 per cent.).

Forthcoming Events

LONDON

Feb. 18.—The Institution of Civil Engineers. "A General Comparison of Gas and Electricity for Heat-Production." A. H. Barker. 6 p.m. Great George Street, Westminster, London.

Feb. 19.—Institute of Chemistry (London and South Eastern Counties Section). "Protection Against Toxic Gases in Industry." J. Davidson Pratt. 7.30 p.m. 30 Russell Square, London.

Feb. 20.—The Chemical Society and the Faraday Society. "The Kinetics of Gaseous Combustion." Dr. R. G. W. Norrish. 8 p.m. Burlington House, Piccadilly, London.

Feb. 21.—Institution of Chemical Engineers. "Colloidal" Fuel. A. B. Manning and R. A. A. Taylor. 6.30 p.m. Burlington House, Piccadilly, London.

BIRMINGHAM

Feb. 20.—The Institute of Vitreous Enamellers (Midland Section). "Heat Resisting Steels and their Application to Pettits and Pettit Design." J. G. Holmes and A. Linley. 7.30 p.m. Chamber of Commerce, New Street, Birmingham.

Feb. 21.—Institute of Metals (Birmingham Section). Open Discussion. "The Fabrication of Metal Structures." 7 p.m. James Watt Memorial Institute, Birmingham.

BRISTOL

Feb. 17.—Society of Chemical Industry. Joint meeting with the Institute of Chemistry. "Medicinal Chemicals." Dr. F. L. Pyman. 7.30 p.m. University, Bristol.

DERBY

Feb. 18.—Society of Dyers and Colourists (Midlands Section). "The Azoic Dyes." Professor F. M. Rowe. Derby Technical College.

HULL

Feb. 18.—Hull Chemical and Engineering Society. "Creep in Engineering Practice." R. W. Bailey. 7.45 p.m. Municipal Technical College, Park Street, Hull.

LEEDS

Feb. 17.—Institute of Chemistry (Leeds Area Section). "Heavy Water." Professor C. K. Ingold. Leeds.

LEICESTER

Feb. 19.—Leicester Literary and Philosophical Society (Chemistry Section). "Hormones." Dr. J. Masson Gulland. 7.45 p.m. University College, University Road, Leicester.

LIVERPOOL

Feb. 21.—Society of Chemical Industry (Manchester Section). Annual joint meeting with the Liverpool Section. "Metals in the Chemical Industry." Professor C. H. Desch. 6 p.m. University, Liverpool.

MANCHESTER

Feb. 19.—Manchester Metallurgical Section. "Refining of Metals by Sodium Carbonate." N. L. Evans. College of Technology, Manchester.

Feb. 20.—The Chemical Society. Joint meeting with the Manchester Sections of the Institute of Chemistry and the Society of Chemical Industry. "Chemistry and Medicine." Dr. J. F. Wilkinson. 7 p.m. Central Library, St. Peter's Square, Manchester.

NEWCASTLE

Feb. 21.—Institute of Chemistry (Newcastle-on-Tyne Section). Joint meeting with the Bedson Club. 33rd Bedson Lecture: "X-ray Analysis and Chemical Constitution." Dr. J. D. Bernal. Newcastle.

NOTTINGHAM

Feb. 20.—Institute of Fuel (East Midland Section). Joint meeting with the Institution of Mechanical Engineers. "High Speed Diesel Engines." Major Goddard. 7 p.m. University College, Nottingham.

SHEFFIELD

Feb. 19.—Society of Glass Technology. "Cast Iron for the Manufacture of Glass Bottle Moulds." N. L. Evans, W. Goacher, J. E. Hurst; "The Effect of Width on the Breaking Strength of Sheet Glass," A. J. Holland, Professor W. E. S. Turner; "The Effect of Edge Polishing on the Breaking Strength of Sheet Glass," A. J. Holland, Professor W. E. S. Turner; "The Art and Technical Schools of Czechoslovakia and Germany," Professor W. E. S. Turner. 2 p.m. University, Sheffield.

WORKINGTON

Feb. 21.—The West Cumberland Society of Chemists and Engineers. "Symposium." 7 p.m. Workington.

Books Received

The Phenomena of Polymerisation and Condensation. A general discussion held by the Faraday Society. September, 1935. London: The Faraday Society. Pp. 412. 22s. 6d.

